A revision of Combretaceae in Australia

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SUMMARY

Combretaceae is a pantropic family containing 18 genera, four having native or naturalised species in Australia.

Terminalia is a genus estimated to contain between 200 - 300 species distributed throughout the tropical world and is the largest and most critical genus in Australia with 29 species. Two species, T. arenicola and T. savannicola are described as new, and T. supranitidifolia is a new name for T. discolor F. Muell. non Spreng.

The morphological features used to distinguish the species have been critically examined, thus enabling clarification of the variation within the species. Detail studies have been made of the changes in shape which occur during the development of the fruit and of the internal structure of the fruit to give a better delineation of the taxa. Field studies of the species over a number of seasons and over a wide area of their distribution gave useful information on the growth and seasonal changes in the plants and the ecological limitations of their distribution.

The flowers, with one exception *T. grandiflora*, are similar in size and shape so the useful diagnostic characters were found to be fruit size and shape, leaf shape and proportions, and distribution of indumentum.

Macropteranthes is a genus endemic in Australia with four species. It is closely related to the genus Lunnitzera which contains two species both being found in Australia.

Quisqualis indica has become naturalised in Northern Australia.

Distribution, citation of specimens and ecological notes are given for each species.

INTRODUCTION

With the beginning of detail vegetation mapping and ecological studies in northern Australia, particularly in relation to soil and water problems, nomenclature and taxonomic problems became manifest in the widely spread members of the genus *Terminalia*. Since members of this genus in many localities are the important tree or shrub element and at times even the dominant one, accurate determinations were needed to characterise the plant communities involved. Revision of the confused taxonomic situation in the genus therefore became of prime importance. In addition the genus contains species of value to the cattle industry as "top feed", has some potential in forestry, is a factor in ethno-botany and includes many species highly regarded as ornamentals.

The genus *Macropteranthes* has attracted interest recently in the general examination of its relationships within the family whilst *Lumnitzera* is included in present studies of mangrove ecology.

HISTORY

Robert Brown (1810) founded the family Combretaceae and included nine genera but gave no method of classification. De Candolle (1828) expanded the limits of the family but included some members of *Nyssaceae*. His classification within the family grouped many of the genera still considered to be related although his subdivisions have been much modified.

Further contributions to the relationships of the genera were made by Eichler (1867) and by Engler and Diels (1899). Bentham and Hooker (1867) included genera of *Hernandiaceae* in the family and *Gyrocarpus* was included in the genera in Flora Australiensis by Bentham three years earlier. These were removed by Brandis (1893).

Exell (1931) gave an artificial key to the genera and with Stace (1966) revised the family and designated the sub-families and tribe groupings followed in this paper.

Since Bentham (1864), no attempt has been made to revise the Australian members of the family for the whole continent but papers describing additional species have been published and some of these have been included in the Northern Territory or Oueensland Floras.

A revision in the Malasian area by A.W. Exell and the revision of the genus *Terminalia* in New Guinea by M. Coode has facilitated the work on the Australian species.

COMBRETACEAE

FAMILY DESCRIPTION modified after Exell in van Stennis, Fl. Mal. 1:4:533.

Trees, shrubs or lianas, rarely sub-herbaceous. **Indumentum** of simple, glandular or multicellular hairs sometimes secreting calcium oxalate and forming scales or present beneath the cuticle making the surface of the leaf minutely verruculose and sometimes pellucid punctate. Leaves opposite, verticillate, spiral or alternate, petiolate (rarely sessile), exstipulate, simple, entire (all Australian species). Glands often present on leaf bases or petioles (and/or lamina in Australian species). Flowers perfect only, or perfect and male in the one inflorescence, usually protogynous, actinomorphic (all Australian species), in axillary or subcapitate spikes or racemes, (single or in pairs on axillary peduncles in *Macropteranthes*). Receptacle (calyx tube) usually in two distinct parts, the lower receptacle surrounding and adnate to the inferior ovary and the upper receptacle produced beyond to form a short or long tube terminating in the calyx lobes. Callyx lobes 4 or 5, rarely 6 or 8 (or almost absent, sometimes accrescent — not Australian). Petals 4 or 5 or absent, conspicuous or sometimes very small, inserted near the mouth of the receptacle. Stamens usually twice as many as the petals, borne inside the upper receptacle, usually in two series, exerted or included; anthers dorsifixed, versatile (or rarely adnate to the filaments — not Australian). Disc intrastaminal, usually present, hairy or glabrous. Style usually free (attached for part of its length to the upper receptacle in Quisqualis). Ovary inferior (or rarely semi-inferior — not Australian),

unilocular, with usually two (sometimes 2 - 12) pendulous, anatropous ovules of which only one usually develops. **Fruit** a pseudocarp, very variable in size, fleshy or dry, usually indehiscent, often variously winged or ridged, one seeded. **Seed** without endosperm, (cotyledons convolute in all Australian species).

Exell and Stace believe the family to be "an extremely natural one" and all of the Australian species fit well within the circumscription of the family. The nearest relationship appears to be with the Myrtaceae.

SUB-FAMILY DIVISIONS. Following Exell and Stace the Australian genera all belong to the sub-family *Combretoideae* with two genera in each tribe *Combreteae* and *Laguncularieae*.

Combretoideae KEY TO TRIBES

Lower receptacle without adnate bracteoles
Lower receptacle with adnate bracteoles
KEYS TO SUB-TRIBES AND GENERA (Australian genera only).
1. Combreteae
Flowers andromonoecious, petals absent. Sub-tribe Terminaliinae
Flowers all usually bisexual, petals present. Sub-tribe Combretinae
2. Laguncularieae
Bracteoles accrescent to form two wings on the fruit, plants not maritime 3. Macropteranthes
Bracteoles not accrescent fruit without wings plants maritime 4 Lumnitzera

HABITAT. The family is essentially tropical and the southern limit of naturally growing plants in Australia is in the vicinity of latitude 24° S. Each species is restricted to a reasonably well defined type of environment although the crucial limiting factors in each case are not understood. Knowledge of the ecological niche in which the plant is found can assist in determination of species and is often more assistance in identification than sterile material.

Following is a general list of the environments in which the species of Combretaceae are most commonly found.

Rainforest including remanent and pioneer areas: T. complanata, T. sericocarpa.

River and creek beds: T. bursarina.

Banks and levees of rivers, creeks or lagoons: T. platyphylla, T. subacroptera.

Rivers or permanent creeks overhanging the water: T. erythrocarpa.

Annual swamps: T. fitzgeraldii.

Maritime sand dunes and beaches: T. petiolaris, T. muelleri, T. arenicola, T. catappa.

Mangrove swamps: Lumnitzera spp.

Blacksoil downs: T. arostrata, T. savannicola, T. volucris.

Monsoonal areas with deeper better class soils: T. grandiflora, T. platyptera, T. ferdinandiana.

Monsoonal areas on poor, usually shallow soils: T. pterocarya, T. carpentariae, T. chillagoensis, T. latipes, T. cunninghamii, T. hadleyana.

Dry areas including areas of low water availability due to topography and deserts: *T. canescens, T. aridicola, T. supranitifolia.*

Eastern coastal sclerophyll forest commonly on granitic hills: *T. porphyrocarpa*, *T. melanocarpa*.

Brigalow areas: T. oblongata.

TERMINALIA Linnaeus, Syst. Nat. ed 12, 2: 674 (1767) et Mant. Pl. 21 (1767) nom. cons. Sloot., Bijdr. Combret. 6 (1919), Bull. Jard. Bot. Btzg. 111:6:12 (1924). Adamaram Adans., Fam. 2:445 (1763) excl. Hort. Malab. 4, t.5. Myrobalanus Gaertn., Fruct. 2:90 t97 fig. 2 (1791). Gimbrenatea R. & P., Prod. Fl. Peru 138, t.36 (1794). Pentraptera, Roxb. (Hort. Beng. 34 (1814) nomen nudum), Fl. Ind. ed Carey 2:437 (1832).

DESCRIPTION OF GENUS, modified after Exell in van Stennis, Fl. Mal. 1:4:548.

Shrub or tree, deciduous. Branching often sympodial. Leaves spirally arranged often crowded at the end of the branchlets, petiolate, entire, glabrous or hairy, sometimes minutely verruculose and pellucid-punctate, frequently with glands on the lamina or petiole, often with domatia. Flowers actinomorphic, sessile, 5 - merous in axillary spikes with male flowers usually towards apex and perfect flowers towards base; male flowers with aborted ovary and lower receptacle resembling pedicels. Calyx glabrous or hairy, lower tube adnate to the ovary, upper tube expanding into shallow cup terminating in deltoid or triangular calyx lobes. Petals absent. Stamens 10 exerted; anthers dorsifixed, versatile. Disc intrastaminal, villous. Style simple, free, exerted, absent in some male flowers. Ovary completely inferior, 2 carpels, unilocular with two pendulous ovules. Fruit a pseudocarp, very variable in size and shape, often drupelike with fleshy mesocarp or dry and leathery with two lateral wings.

SUBGENERIC DIVISIONS The only two sections published as applying to the Australian species have been *Catappa* and *Myrobalanus*. Bentham doubted the validity of the divisions for Australia and Exell found the sections served no useful purpose in his treatment of the Malasian species. Study of the fruit development indicates that some species matching the description of the section *Catappa*; that is, fruit with two longitudinal, membranous or coriaceous wings, in the immature stage develop into fruits of the section *Myrobalanus*, that is fruit globular, ovoid, terete or slightly compressed, sometimes surrounded by a prominent acute angle, but not distinctly winged. As no other character has been found consistent for the two sections their validity is extremely doubtful.

HABIT. All members of the genus are deciduous shrubs or trees varying from about 2 to 40 m in height, usually with a single trunk. Variations in the local climate have considerable influence on the stature of some species. In Arnhem Land *T. carpentariae* seldom exceed 4 m on the tops of the sandstone plateau but may exceed 15 m in the intervening valleys. The well known "Pagoda" shape that members of the genus assume

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as young trees is only found in a few species in Australia namely T. catappa, T. muelleri, T. subacroptera, T. melanocarpa, T. arenicola and T. complanata.

Although the members of the genus are deciduous, the pattern of leaf fall varies considerably to the point that some specimens in favoured localities retain some canopy throughout the whole year. Many species are leafless for periods exceeding three months while others are seldom without leaves for more than a week. The factors which control leaf fall and regrowth are not understood but to some extent they are influenced by soil desiccation and the onset of the monsoon season. Leaf loss occurs at varying times during the dry season but regrowth is generally well advanced before the first rain has fallen. T. catappa commonly also drops its leaves during the rainy period.

BARK. Rough fissured bark is the basic pattern for the genus but the depth and pattern of the fissures, allowing for reasonable variation, is constant for each species. The bark of the trunks of mature trees generally fit into one of the following categories:

Deeply tessellated bark — Strong longitudinal and transverse fissures exceeding 1 cm in depth and usually more than 2 cm wide.

Finely tessellated bark — Numerous longitudinal and transverse fissures seldom more than 1 cm deep or wide.

Longitudinally fissured bark — Strong longitudinal fissures with smaller and more widely separated transverse fissures.

Persistent plate bark — Irregularly fissured bark producing thin, hard plates of irregular size and shape which persist on the trunk.

Rough bark decorticating in areas — Rough irregularly fissured bark with small or large areas decorticating to reveal orange or yellow nearly smooth bark.

Smooth finely fissured bark — Smooth or near smooth bark with irregular fissures seldom exceeding 2 mm width.

BRANCHING. Within the genus sympodial branching is common. It is characterised by the growth of one, sometimes two axillary branchlets from the lower side of the terminal branchlet and extending beyond it and subsequent branching developing in the same manner without the earlier branchlets dying.

FOLIAGE. The genus received its name from the crowding of the leaves at the ends of the branchlets, a character which is common to many species. The leaves are spirally arranged on petioles of various lengths but due to the crowding this arrangement may be obscured in some species. Some species have predominantly the crowded arrangement of leaves (e.g. *T. catappa, T. latipes*), few have a loose arrangement (e.g. *T. fitzgeraldii*), while others have both types commonly on the one branch (*T. platyphylla*).

Leaf size and to a less degree shape are widely varied within each species and both are influenced by ecological factors in addition to the genetic differences. Available water is by far the most important ecological factor influencing leaf size and shape. Leaves collected at Katherine, N.T. from marked trees of *T. ferdinandiana* during the above average rainfall season of 1968-69 exceeded 30 cm in length yet no leaves could be found exceeding 24 cm during the following below average rainfall season. Distinct differences in leaf size of *T. carpentariae* have been noted between specimens collected

from the tops of sandstone cliffs (usually 5 - 7 cm long) and those from the gullies below (8 - 12 cm long). The normally obtuse leaf apices of some species have been observed to become acuminate in very wet situations (e.g. *T. subacroptera*, *T. sericocarpa*).

Juvenile foliage, where known, is generally similar to that of the adult attaining full size within the first season but *T. arostrata*, *T. grandiflora*, *T. savannicola* and *T. platyptera* have very small juvenile leaves and this may continue for several seasons. Reversion growth is often characterised by large leaves.

On mature trees, the leaf size on each shoot varies with the sequence on the shoot. The first formed leaves can be less than one quarter the size of those developed during the middle of the growth period with smaller leaves again occurring towards the end of the growth period. In addition to these factors, variation of a wide range occur which, at present, can only be attributed to the genetic constitution of the individual plants.

It was noted that the leaf size of most herbarium specimens of those species with large leaves were much smaller than the average for the species as observed in the field. This would be mainly due to selection by the collector of smaller specimens for convenience of processing.

With the exception of *T. petiolaris*, the mature leaves are thick to very thick and leathery but some confusion has occurred because many specimens collected at the time of flowering have the thinner immature leaves. (See under *T. latipes*).

The pellucid punctation found in some species is due to crystals of calcium oxalate which form minute warts on one or both surfaces. When the leaf is held up to the light these appear as translucent dots. Their occurrence is not always consistent and not of great diagnostic value.

Domatia are common on the underside of the leaves of most species either along the midvein at the junctions with the primary veins, along the primary veins or both. They appear as distinct depressions or small cavities usually filled with long hairs. The types of domatia have been dealt with by Stace (J. Linn. Soc. (Bot.) 59:378:229) but he only examined a few Australian species.

Two types of glands are present in the genus. One type has a small orifice and sometimes exudes gum (e.g. in the leaf base of *T. catappa*) while the other is an aggregation of parenchyma cells containing calcium oxalate crystals (e.g. on lamina of *T. ferdinandiana*). The former are common on the petioles and the base of the lamina and may be distributed on the primary veins. The latter are generally more restricted in their distribution and are usually found on the lamina towards the ends of the primary veins. Insects, particularly ants are attracted to the glands which exude gum. The presence and distribution of each type of gland is dependent on the species although some species show a wide degree of variability in location of the glands.

SPIKE. In all Australian species, flowering occurs on simple axillary spikes at the time of growth of new foliage. The rachis of the spike continues to grow in length for some time after flowering. Bracts are caducous and are rarely seen on specimens but the minute scars can be seen along the rachis.

FLOWERS. Exell (Fl. Mal. 4:549) in his treatment of the Malasian species stated

"Apart from small differences in size and indumentum, the flowers of *Terminalia* are remarkably uniform in structure and offer few features of diagnostic value" and this statement can be applied equally to the Australian species. In addition the continuing growth in length of the flower until it falls or develops into a fruit, the differences in diameter depending on its position on the rachis and general differences in size due to ecological factors give most species an overlap in the sizes of flower.

FRUIT. Strictly the term pseudocarp should be used as the fruit develops from the calyx tube but the succulent fruits are commonly referred to as drupes. In the Australian species the fruit is either dry with two lateral wings or succulent and near circular in cross section when mature. The immature fruit of the succulent fruiting varieties can differ markedly from the mature fruit and as it is at this stage that most specimens are seen or collected, knowledge of fruit development is most useful. The fruit, based on their mode of development, can be separated into five general categories.

- 1. Dry winged fruit have lateral wings or are circumalate and have no succulent tissue when mature. The wings are thin and develop early e.g. *T. pterocarya*.
- 2. Laterally compressed fruit with two \pm even, lateral ridges extending the full length of the fruit and confluent with the beak, the ridges becoming totally or partially obscured as the fruit becomes succulent e.g. T. latipes.
- 3. Laterally compressed fruit with the lateral ridges developing into wings towards the apex, usually beakless but sometimes apiculate. As the fruit matures, the wings disappear generally leaving a transverse angle across the apex of the fruit e.g. *T. aridicola*.
- 4. Cylindrical or only slightly compressed fruit with or without angles or rarely with ridges. The angles or ridges, when present, are confined to the apical end of the fruit and disappear as the fruit ripens and develops the succulent layer e.g. *T. platyphylla*.
- 5. Nearly globular fruit, rarely with lateral angles or ridges when immature, becoming smooth, circular in cross section, usually exceeding 2 cm in diameter, and succulent as the fruit ripens e.g. *T. arostrata*.

The fruit contains a variety of tissues apart from the normal vascular tissue and the occurrence and distribution of these tissues have diagnostic value. Sclerenchyma is well developed in most species and generally forms an inner "stone" of the fruit. Alveolar tissue consisting of resin lined macroscopic spaces, corky cells and soft mucilagenous cells often radially orientated may be present dependent on the species. Mucilage canals are common and large mucilage spaces are found in *T. complanata*.

The fruits generally grow to full length and nearly full width within a few weeks of fertilisation. Size increase may be suspended at this stage for periods up to eight months and during this time the embryo matures. In the succulent fruited species at maturity the flesh develops quickly, the fruit becoming rounded and often changing colour. The final stage may not be reached in some species until after the tree loses its leaves e.g. *T. carpentariae*.

INDUMENTUM. Within the genus an indumentum of compartmented hairs occurs with varying distribution, length and density dependent on the species, age and organ.

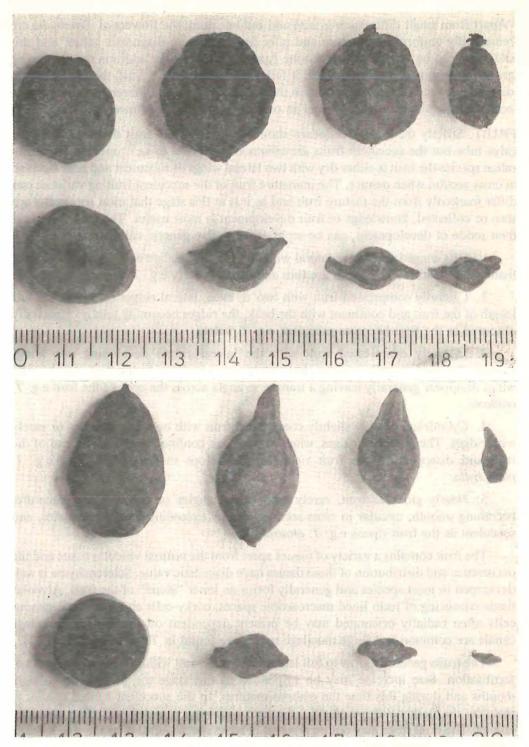


Figure 1. FRUIT DEVELOPMENT Terminalia aridicola Terminalia latipes

The silky hairs covering the disc of the flower is the only uniform feature for the genus. The deciduous nature of the indumentum is significant in some species. Plants growing in exposed situations or the exposed parts of a tree may lose indumentum prematurely. Some species with normally pubescent leaves can become glabrous very late in the season e.g. *T. carpentariae*. The distribution of the indumentum is one of the more valuable characters for the determination of the species and, with only few exeptions, is consistent within a small range of variation for each species.

KEYS TO SPECIES. The wide variability and changes during growth which occur within the species, particularly the changes in the shape of the fruit as it matures and subsequently dries have been covered as far as possible in the following keys.

As specimens are seldom collected with both flowering and fruiting material, Key 1 is designed to cover material at the fruiting stage and Key 2 at the flowering stage.

KEY 1.

1.	Fruit with horn(s) or tubercules on at least one surface
	Fruit without horn(s) or tubercules on either surface
2.	Fruit with wings wider than long
	Fruit wingless or if winged not wider than long
3.	Fruit hairy, 4 - 12 cm wide including the wings
	Fruit glabrous, 2.5 - 7 cm wide including the wings
4.	Lamina of leaf more than twice as long as wide
	Lamina of leaf less than twice as long as wide
5.	Fruit with wing of nearly even width continuous around body
	Fruit wingless or if winged then wing wider towards the apex
6.	Fruit glaucous, usually pubescent
	Fruit not glaucous, glabrous 6. T. pterocarya
7.	Fruit with persistent dense pubescence
	Fruit glabrous, glabrescent, or sericeous, not densely pubescent
8.	Leaves glabrous
	Leaves pubescent
9.	Fruit winged towards apex when immature, usually globular with a transverse angle at the apex when mature
	Fruit ridged, not winged when immature; ovoid, usually beaked when mature . 18. T. carpentariae
10.	Mature fruit 5 - 8 cm long
	Mature fruit 1 - 4 cm long

11.	Fruit globular or ovoid, less than 1.2 cm diam. with a terete beak and corky tissue 28. T. erythrocarpa
	Fruit variously shaped, if globular or ovoid with a terete beak then more than 1.5 cm diam. and without corky tissue
12.	Fruit more than 2 cm diam, and with well developed areas of alveolar tissue
	Fruit less than 2 cm diam. or more than 2 cm diam. but without well developed areas of alveolar tissue
13.	Fruit beakless or nearly so and globular
	Fruit beaked, the beak sometimes swollen to make the whole fruit ovoid
14.	Petioles 2 - 5 cm long
	Petioles 0.5 - 1.5 cm long
15.	Leaves ovate, glabrescent
	Leaves obovate, glabrous
16.	Branchlets markedly swollen at the crowded nodes; fruit usually more than 3 cm diam. 10. T. cunninghamii
	Branchlets not markedly swollen at the crowded nodes; fruit usually less than 2.5 cm diam 17
17.	Leaves discolorous, 5 - 14 cm wide
	Leaves concolorous, 1 - 2 cm wide
18.	Fruit with mucilage spaces, compressed ellipsoid with thick lateral ridges 27. T. complanata
	Fruit without mucilage spaces, if compressed not ellipsoid with thick lateral ridges
19.	Fruit sericeous
	Fruit glabrous or thinly pubescent
20.	Fruit 1.7 - 2.5 cm wide with corky tissue
	Fruit usually less than 1.5 cm wide, without corky tissue
21.	Fruit cylindrical or ellipsoid with a ring of alveolar tissue, when immature sometimes compressed with lateral angles
	Fruit ovoid or globular, without or with isolated small areas of alveolar tissue, when immature compressed with lateral wings or ridges
22.	Leaves thin and broadly ovate
	Leaves thick and obovate
23.	Fruit 2 - 4 cm long; leaves flat with raised reticulations below
	Fruit 0.5 - 2 cm long: leaves usually with recurved margins and reticulations not markedly raised 24
24.	Domatia conspicuous; leaves glabrous; fruit 0.8 - 1.5 cm diam
	Domatia small or absent; leaves usually hairy below; fruit 0.5 - 0.9 cm diam 15. T. subacroptera

25.	Leaves with dense indumentum on both surfaces
	Leaves glabrous or glabrescent early at least on the upper surface
26.	Leaves with recurved margins, usually hairy below; mature fruit with narrow succulent tissue 15. T. subacroptera
	Leaves flat, usually glabrous below; mature fruit with wide succulent tissue (excess 50% diam.) 27
27.	Petioles more than 2 cm long; lamina usually more than 5 cm wide
	Petioles less than 1.5 cm long; lamina usually less than 5 cm wide
28.	Fruit with beak and when immature with lateral ridges
	Fruit without beak and when immature with lateral wings expanded towards apex
29.	Leaves obovate; fruit longer than wide
	Leaves ovate; fruit usually as long as wide
30.	Fruit 2 - 3 cm long; when immature commonly retuse at apex
	Fruit 1 - 2 cm long; when immature not retuse
31.	Fruit ovoid, usually shortly beaked, when immature with ridge of about even width 22. T. supranitifolia
	Fruit globular, commonly apiculate but not beaked, when immature with wing wider towards apex. 25. T. porphyrocarpa
	KEY 2
1.	KEY 2 Flowers 1.5 -, 2 cm long
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	Flowers 1.5 -, 2 cm long
	Flowers 1.5 -, 2 cm long
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2.	Flowers 1.5 -, 2 cm long
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8. Petioles 0.5 - 1.5 cm long
Petioles 1.5 - 7 cm long
9. Leaves sparsely hairy; calyx lobes glabrous
Leaves densely hairy at least on the undersurface, calyx lobes usually pubescent
10. Style glabrous; leaves usually more than 5 cm wide
Style hairy towards base; leaves usually less than 5 cm wide 1. T. platyptera
11. Style hairy towards base; domatia when present on primary veins
Style glabrous; domatia absent or along midvein
12. Leaves concolorous; small domatia present along midveins
Leaves discolorous; domatia absent
13. Petioles of mature leaves more than 2 cm long
Petioles of mature leaves less than 2 cm long
14. Lamina usually more than 20 cm long and subcordate at the base
Lamina usually less than 20 cm long and not subcordate at the base
15. Leaves thin, usually ovate on slender petioles
Leaves thick, if ovate then on thick petioles
16. Calyx lobes acuminate; leaves glaucous
Calyx lobes acute; leaves rarely glaucous
17. Calyx lobes densely pubescent
Calyx lobes glabrous or sparsely hairy
18. Leaves usually ovate to elliptical and shortly attenuated at the base
Leaves obovate and markedly attenuated at the base
19. Both shoot and spike glabrous or with a few scattered hairs
Either shoot or spike or both hairy
20. Lamina concolorous, 5 - 10 cm long; domatia usually conspicuous 9. T. fitzgeraldii
Lamina discolorous, 8 - 17 cm long; domatia small
21. Leaves concolorous and isobilateral
Leaves discolorous and dorsiventral
22. Flowers 5 mm diam.; leaves 1.5 - 3 cm wide
Flowers 7 mm diam.; leaves 2.5 - 10 cm wide
23. Domatia usually common and large; some flowers commonly flecked with red 14. <i>T. muelleri</i>
20, 20 made adding common and jurge, some nowers commonly necked with red 14. 1. Muchel

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	Domatia rare or small; flowers not flecked with red
24.	Calyx tube pubescent; style hairy
	Calyx tube and style glabrous
25.	Leaves isobilateral and concolorous
	Leaves dorsiventral and discolorous
26.	Spike rachis and calyx glabrous
	Spike rachis and calyx tube pubescent
27.	Branchlets slender, pendulous, not markedly swollen at the crowded nodes 7. T. arostrata
	Branchlets thick, erect, markedly swollen at the crowded nodes 10. T. cunninghamii
28.	Petioles less than 0.4 cm long; without glands on the petioles or leaf bases 4. T. bursarina
	Petioles 0.3 - 3 cm long; glands on petioles or leaf bases
29.	Leaves markedly glaucous, usually three times as long as wide 5. T. canescens
	Leaves not markedly glaucous, usually twice as long as wide 6. T. pterocarya
30.	Lamina very large, 9 - 36 cm long and petioles less than one-twelfth of the length of the lamina 31
	Lamina 1 - 9 cm long or if longer then petiole at least one-tenth of the length of the lamina 32
31	Domatia along midvein
	Domatia along primary veins
32	Style hairy towards the base
	Style glabrous
33	. Domatia absent; rachis of spike glabrous or with sparse indumentum
	Domatia present; rachis of spike with dense indumentum
34	Petioles ca 0.5 mm wide; lamina usually more than twice as long as wide 3. T. oblongate
	Petioles ca 1 mm wide; lamina usually less than twice as long as wide 2. T. volucris
35	. Calyx tube sericeous; leaves flat
	Calyx tube pubescent; leaves with recurved margins
36	. Calyx pilose; leaves acute or acuminate
	Calyx lobes glabrous; leaves usually obtuse
37	. Flowers often flecked red; domatia present and usually large
	Flowers not flecked red; domatia absent or small
38	. Calyx tube with dense appressed pubescence; W.A. species
	Calyx tube glabrous or thinly pubescent; Qld. species

- Terminalia platyptera F. Muell., Fragm. 2:151 (1861), Fragm. 9:160 (1875);
 Benth., Fl. Aust. 2:489 (1864); F.M. Bail., Qd Fl., 564 (1900), Comp. Cat.
 Qd Pl. 180 (1913); Ewart & Davies, Fl. N. Terr. 213 (1917); Fitzgerald, J.
 Proc. Roy. Soc. W.A. 3:182 (1918); Specht & Mountford, Am.-Aust. Sc.
 Exp. Arnhem Land 3:465 (1958). Lectotype: Lynd River, Leichhardt (MEL).
 - T. platyptera var.? glabrata F. Muell. ex Benth., Fl. Aust. 2:489 (1864); F.M. Bail., Qd Fl. 564 (1900). Type: Arnhem Land, F. Mueller (K).

Tree to 15 m high, deciduous or semideciduous. Trunk and branches with dark grey tessellated bark. Branchlets hoary pubescent, commonly sympodial. Leaves spirally arranged, commonly crowded; glands usually in pairs on petioles; lamina coriaceous, discolorous, obovate to broadly obovate or rectangular, very obtuse or sometimes retuse, cuneate at the base, 2 - 8 cm long, 1 - 5 cm wide, pubescent on both surfaces when young, glabrescent above; domatia absent; petioles pubescent, 1 - 1.5 cm long. Spike andromonoecious, pubescent, dense or interrupted, exceeding the leaves; bracts narrowly triangular to spathulate, 2 - 4 mm long, caducous. Flowers both male and perfect 3 - 8 mm long, ca 5 mm diam. Calyx pubescent outside; lobes broadly triangular, 2 x 1.5 mm, pubescent inside. Stamens with glabrous filaments 2 - 4 mm long. Disc and style villous. Mature fruit a two winged nut, pubescent, hairs becoming scattered on the wings, light green to straw yellow; body 1.5 - 3 cm long; wings divaricate, broadly obovate or rarely rectangular, continuous above body 4 - 12 cm wide, 2 - 6 cm deep at lobes, with raised striate venation; in cross section showing a well developed sclerenchymatous core with small irregular patches of parenchyma some containing canals (?mucilage) variously located around the core, alveolar and succulent tissue absent; similar but smaller and green when immature.

WESTERN AUSTRALIA: Denham R., Oct 1906, Fitzgerald 1636 (NSW, PERTH); Martini Ck, Jun 1944, Gardner 7414 (PERTH); Wyndham, May 1944, Gardner 7309 (PERTH); 10 miles N of Bow R. Stn, Apr 1955, Lazarides 5055 (CANB, NSW, AD); Kimberley Res. Stn, Martins Gap, Apr 1956, Burbidge 5128 (CANB); Kimberley Res. Stn, Oct 1951, Langfield 237 (CANB); 10 miles E of Kimberley Res. Stn, Jul 1949, Perry 2573 (CANB. NSW). NORTHERN TERRITORY: Upper Victoria R., Dec 1855, Mueller (paralectotype, MEL); 60.4 miles N of Top Springs, Nov 1965, Chippendale (NSW, NT); 23 miles SW of Birrimbah Outstation, Jun 1949, Perry 2065 (CANB, BRI); SW of Katherine, Apr 1969, Bymes 1553 (DNA); 22 miles W of Katherine, Apr 1969, Bymes 1542 (DNA); Willeroo Rd, Jun 1970, Bymes 1926 (DNA); 15 miles N of Katherine, May 1969, Bymes 1499 (DNA); 13 miles W of Ooloo Hsd, Aug 1961, Lazarides (CANB, NSW, PERTH); Katherine, Dec 1964, Adams 1936 (CANB, NSW) & Oct 1946, Blake 17223 (CANB, BRI); 1 mile E of Katherine Airport, Jul 1969, Byrnes 1692 (DNA); Katherine Gorge Rd, Jan 1965, Robinson R 1109 (DNA); Beswick Reserve, Sep 1964, Robinson R 856 (DNA); Elsey Graves, 11 miles S of Mataranka, Jan 1968, Latz 88 (NT); Elsey Cemetry, Jul 1958, Trapnell 71 (BRI); 10 miles S of Larrimah, Nov 1968, Byrnes 1179 (DNA); 40 miles N of Daly Waters, Mar 1969, Byrnes 1466 (DNA); 3 miles S of Larrimah, Feb 1969, Byrnes 2353 (DNA); 30.7 miles E of Birdum, Aug 1947, Perry 403 (CANB); Roper Valley Stn, May 1969, Bymes 1611 (DNA); 6 miles E of Mary R, Oenpelli Rd, Apr 1970, Byrnes 1916 (DNA). QUEENSLAND: BURKE DISTRICT: 34 miles N of Hughenden, Feb 1931, Hubbard & Winders, 7474 (BRI). COOK DISTRICT: Georgetown, Jun 1942, Francis (BRI); Lyndbrook, Aug 1913, Cambage (NSW); Cumberland, Gilbert R, Mar 1925, Brass (BRI) and Feb 1922, White 1370 (BRI); Mt Mulligan, Dec 1939, Flecker (BRI); Chillagoe, Jan 1918, Michael (BRI) and Aug 1963, Trezise (BRI); 8

miles W of Dimbulah, Jun 1955, Tracey & White (BRI); 15°40'S 144°33'E, Jul 1965, Gittins 964 (BRI, NSW); Laura, Oct 1962, Smith 11682 (BRI).

Range: Australia north of latitude 20° S. mainly in Cape York Peninsula, Arnhem Land, Lower Victoria River and Kimberley Districts.

Habitat: Common on basalt and river levee soils and on deep soil on flat or undulating country.

Observations and Notes: This species usually has a single straight trunk with short, angular, nearly horizontal branches giving it a characteristic appearance and enabling comparatively easy field identification. Flowering occurs about December with the new seasons growth and the fruit matures from April to July depending on local conditions. The rainfall pattern of the current season or the water available in the local situation determines the degree of leaf fall. New growth is restricted to a short period in the early wet season unless some additional factor (fire, insect defoliation) upsets the normal sequence.

The indumentum density declines with age and exposure to mechanical factors resulting in the older leaves becoming nearly glabrous. In addition the leaves become more coriaceous with age and when these factors are considered with the normal variability found in the species the var. ? glabrata cannot be recognised.

Of the specimens available to Mueller in Melbourne the specimen chosen as lectotype had fruit and most closely matched the description. The label is written in Mueller's hand but no collectors name appears on the label or is given with the description. Bentham lists the Lynd River specimen as being collected by Leichhardt and his initials on the label indicate he saw this specimen. Mueller gave a general locality of around Gulf of Carpentaria.

Terminalia volucris R. Br. ex Benth., Fl. Aust. 2: 489 (1864); F.M. Bail., Qd F1.565 (1900), Comp. Cat. Qd Pl. 180 (1913); Ewart & Davies, Fl. N. Terr. 213 (1917); Fitzgerald, Proc. Roy. Soc. W.A. 3: 182 (1918); Gardner, W.A. Forest Dept. Bull. No 32: 71 (1923); Specht & Mountford, Am.-Aust. Sc. Exp. to Arnhem Land, 3: 465 (1958). Type: Island a 28 (Sweers Island) 17 Nov 1802, R. Brown (BM, lectotype; K, iso)

T. volucris var. (?) coriacea Benth., Fl. Aust. 2:499 (1864); F.M. Bail. Qd Fl. 565 (1900). **Type:** Upper Victoria River. Dec. 1855, F. Mueller, (K)

Shrub or tree to 8 m high, deciduous. Trunk with grey tessellated bark. Branches with finely fissured smooth bark. Branchlets appressed pubescent or villous at first, glabrescent. Leaves spirally arranged, rarely crowded; glands present on the petiole or in the base of the lamina; lamina sub-coriaceous, discolorous, obovate to broadly elliptical, obtuse to retuse, rarely acute, cuneate or attenuated at the base, sometimes narrowly decurrent along the petiole, 1.5 - 8 (-11) cm long, 1 - 4.5 (-8) cm wide, glabrous or with a few scattered hairs, commonly minutely verruculose above, sometimes pellucid-punctate; domatia absent; petioles glabrescent, 0.5 - 1.5 cm long. Spike andromonoecious the male flowers few, interrupted, thinly pubescent to glabrous, exceeding the leaves; bracts narrowly triangular; ca 1 mm long, caducous. Flowers both male and perfect 5 - 8 mm long, ca 5 mm diam. Calyx tube pubescent;

lobes triangular 1.5 x 1.5 mm, pilose outside, thinly villous inside. Stamens with glabrous filaments, 2 - 3 mm long. Disc villous. Style villous in the lower part, glabrous above. Mature fruit a glabrous two winged nut; body 1 - 2 cm long, flattened on one side and with a longitudinal ridge on the other; wings broadly elliptical to rectangular, continuous above or below the body or both, 3 - 7 cm wide, 2 - 3 cm deep at the lobes, dry, straw yellow; in cross section showing a narrow ring of sclerenchymatous tissue with some irregularly distributed areas of parenchyma tissue, alveolar tissue, succulent tissue and mucilage canals absent; similar in shape but smaller and green when immature.

WESTERN AUSTRALIA: Mt Marmion, Oct 1921, Gardner 1606 (PERTH); Lennard-Barker R., Oct 1905, Fitzgerald 1584 (PERTH); King R., Oct 1906, Fitzgerald (NSW); Mantini Ck, Jun 1944, Gardner 7415 (PERTH); Kurrungi, Apr 1955, Rust 6 k (CANB); Kurrungi, Oct 1954, Rust 27 k (CANB); 30 miles WSW of Kurrungi, Sep 1954, Speck 4999 (CANB); near Kurrungi Stn, Sep 1954, Speck 5008 (CANB, BRI, PERTH); near Wyndham, Sep 1906, Fitzgerald (NSW); Kimberley Res. Stn, Oct 1949, Langfield 129 (CANB); Kimberley Res. Stn, Feb 1964, Richards 11 (CANB); Kimberley Res. Stn, Mar 1956, Rust 113 (CANB); Northern Territory: Victoria R., Dec 1855, Mueller (MEL, K - lecto- paratypes); 2 miles E of Keep R., May 1969, Byrnes 1565 (DNA); Wavehill, Jun 1949, Perry 2236 (CANB, NSW, PERTH); 30 miles W of Top Springs, May 1969, Byrnes 1588 (DNA); Kildurk Stn, May 1969, Byrnes 1569 (DNA); Willeroo, Dec 1969, Harpley (DNA); Willeroo, Sep 1969, Byrnes 1701 (DNA); 32 miles S of Daly R. Police Stn, Oct 1963, Muspratt SSO613 (DNA);? Port Darwin, in 1885, Holtze 37 (MEL); in 1891, Holtze 1211 (MEL); Port Keats, NW Australia, Sep 1819, Cunningham 442 & 443 (K — lectoparatypes); 3 miles N of Katherine, Sep 1964, Lazarides 6691 (CANB, BRI, NSW, AD, PERTH); Brocks Ck, Jun 1946, Blake 16232 (CANB, BRI); 205 miles S of Katherine, Nov 1968, Bymes 1175 (DNA); Beswick Reserves, Sep 1964, Robinson R 854 (DNA); Elliott, Nov 1969, Maconochie (AD); Headwaters of Kilgour R., Apr 1970, Bymes 1886 (DNA); 8 miles NE of Creswell Stn, Jul 1948, Perry 1611 (CANB); Lower McArthur R., Apr 1970, Byrnes 1876 (DNA); Settlement Ck, Oct 1923, Brass 340 (CANB, BRI). QUEENSLAND: BURKE DISTRICT — Golden Ck, Tully Inlet, Nov 1922, Brass 242 (CANB, BR1); Westmoreland & Corinda Stns, Jun 1948, Perry 1361 (CANB, BRI, NSW); 10 miles from Croydon, Sep 1950, Symonett (BRI) Black Bull Ck, Croydon, in 1891, Burton (BRI).

Range: Northern Australia from the Kimberley region of W.A. to the Gulf of Carpentaria mostly between 13°S. and 18°S. latitude.

Habitat: Blacksoil plains and seasonal swampy areas sometimes occurring in pure stands, or rarely on deeper sandy soils along rivers or creeks.

Observations and Notes: The relationship of this species to *T. oblongata* is very close but the proportionately wider leaf and thicker petiole of *T. volucris* is sufficient to enable the species to be separated.

Although one leaf of the type specimen of *T. volucris* var. ? coriacea is 11 cm long and 8 cm wide the remaining leaves fit well within the normal size range of the species. This piece of material is atypical as indicated by the presence of leafy bracts and is more likely to be an aberrant form or diseased shoot and is insufficient to establish the variety.

The species loses its leaves during July and August and flowers before or with the development of the new leaves. Occasionally the fruit of some plants reaches an advanced stage of development before the new foliage appears. The fruit ripens during December and falls almost immediately.

It is known locally as "Rosewood" and is regarded as a valuable "top feed" particularly as the new leaf often appears when other green feed is at a minimum. Cattle feeding solely on this species may suffer from oxalate poisoning.

Bentham used Brown's name for the species and made special reference to his specimens. As the better specimen of Brown's collection with both flower and fruit is located in the British Museum then this specimen is nominated as the lectotype. Bentham sighted the two specimens collected by Mueller at Victoria R. in 1855 and Cunningham's specimens from Port Keats collected in 1819.

3. Terminalia oblongata F. Muell., Fragm.2: 152 (1861), Fragm. 9: 160 (1875); Benth., Fl. Aust. 2: 499 (1864); F.M. Bail., Qd Fl. 565 (1900), Qd Woods, 63 (1899), Comp. Cat. Qd Pl. 180 (1913); Ewart & Davies, Fl. N. Terr. 213 (1917); Audas, Native Trees of Aust. 277 (1934); Everist, Qd D.P.I. Adv. Leafl. No. 1024: 33 (1969). Lectotype: Suttor and Dawson (Rivers), F. Mueller (MEL1005514).

Shrub or tree to 15 m high, deciduous. Trunk and branches with strongly longitudinally furrowed tessellated bark. Branchlets glabrescent. Leaves spirally arranged on long thin branchlets or crowded on short thicker branchlets; glands sometimes present on lamina; lamina sub-coriaceous, discolorous, narrowly elliptical or obovate, often rectangular, rarely broadly elliptical or broadly obovate, very obtuse, often retuse, attenuated at the base, 1 - 6 cm long, 0.5 - 1.5 (-2.5) cm wide, glabrous or with a few scattered hairs, commonly minutely verruculose above, mostly pellucid punctate; domatia absent; petioles glabrous, slender, 0.2 - 1 cm long. Spike andromonoecious, slender, interrupted, thinly pubescent to glabrous, usually exceeding the leaves; bracts narrowly triangular ca 1 mm long, caducous. Flowers both male and perfect 5 - 8 mm long, 5 mm diam. Calyx pubescent, pilose or nearly glabrous outside; lobes narrowly triangular, 1.5 x 2 mm, villous inside. Stamens with glabrous filaments ca 3 mm long. Disc villous. Style villous on the lower part, glabrous above. Mature fruit a glabrous two winged nut; body 1 - 2 cm long, flattened on one side and with a longitudinal ridge on the other; wings broadly elliptical to rectangular, continuous above and below the body, 2.5 - 6 cm wide, 1.5 - 3 cm deep at the lobes, dry, straw coloured; in cross section showing a narrow ring of sclerenchymatous tissue with some irregularly distributed areas of parenchyma tissue, alveolar tissue, succulent tissue and mucilage canals absent; similar in shape but smaller and green when immature.

QUEENSLAND: LEICHHARDT DISTRICT: Dawson R., Mueller (lectoparatype, K); 11 miles S of Emerald, Sep 1964, Adams 1395 (CANB, BRI, NSW, PERTH); Emerald, Nov 1935, Blake 10221 (BRI, AD); Moura, Apr 1961, Jones 1791 (CANB); 10 miles E of Duaringa, Oct 1963, Speck 1814 (CANB, BRI, NSW): Duaringa, Nov 1943, White 12452 (BRI); State Farm, Gindie, Apr 1920, Francis (BRI): Clayfield, Kokotunga, Ferguson (BRI): 36 miles S of Lotus Creek, Jan 1970, Byrnes 1729 (DNA); 22° 48'S, 149° 20'E., Nov 1969, Auldist 25 (BRI, DNA): 22° 40'S. 149° E. Nov 1969, Auldist (BRI, DNA): Blair Athol, Massey (BRI): 22° 40'S. 149° 15'E., Nov 1969, Auldist (BRI, DNA). MITCHELL DISTRICT: 80 miles NE of Aramac, Jun 1960, Purcell (BRI): North Kennedy District: Charters Towers — Woodstock Rd, Apr 1965, Lazarides 7161 (CANB): Home Hill, Pollock (BRI): Mingela, Nov 1965, McCocker (BRI): Port Curtis District: Marlborough, Jun 1960, Jones 1555 (CANB): Westwood — Wowan, Dec 1944, Shaw 85 (CANB): Stuarts Ck, Stanwell, Oct 1954, Webb SN5333 (CANB): Ogmore, Oct 1950, Smith 4664 (BRI); Rockhampton, Bailey (BRI): South Kennedy District: 70 miles WNW of Clermont, Jun 1966, Curtis (BRI): Suttor R., Feb 1908, Murrat (BRI): 12 miles W of Collinsville, Sep 1950, Smith (BRI); Suttor R., Thozet (MEL).

Range: Queensland in the catchment areas of the Fitzroy and Burdekin Rivers and their tributaries.

Habitat: In shrubland and open sclerophyll forest in association with *Acacia harpophylla* F. Muell, and *Acacia cambagei* R.T. Baker. It favours the edges of seasonal or permanent creeks and areas subjected to annual flooding.

Observations and Notes: This species loses its leaves during August and September and flowers with the new growth in late October and November. The fruit matures in December and January and falls readily. *T. oblongata* is closely related to *T. volucris*. (see under *T. volucris*)

If not eaten excessively, *T. oblongata* is valuable "top feed" for grazing animals particularly as the new growth occurs when green feed is scarce. It is known in Queensland as "Yellow-wood".

Mueller noted only two localities in his description and these are areas from which he collected his specimens. Of these collections only one sheet is in Melbourne and as this specimen matches the description it was selected as the lectotype.

The lectoparatype from Dawson R., labelled *T. lasiantha* Ferd. Mueller has on the same sheet a second sterile specimen labelled similarly but noted as coming from Arnhem Land. This specimen although sterile can be placed in *T. oblongata* with a reasonable degree of confidence. Mueller used the locality name "Arnhem Land" in a much wider sense than is understood by the present concept of the name.

4. Terminalia bursarina F. Muell., Fragm. 2:149 (1861); Benth., Fl. Aust. 2:499 (1864); F.M. Bail., Qd Fl. 565 (1900), Comp. Cat. Qd Pl. 180 (1913); Ewart & Davies, Fl. N. Terr. 212 (1917); Fitzgerald, Proc. Roy. Soc. W.A. 3:182 (1918); Gardner, For. Dept. Bull. No 32:72 (1923); Specht & Mountford, Am. - Aust. Sc. Exp. to Arnhem Land 3:265 (1958). Lectotype: Upper Victoria River, Dec. 1855, F. Mueller, (MEL1005515).

Shrub rarely tree to 8 m high, deciduous or semi-deciduous. Branches and trunk with longitudinally fissured, dark grey bark. Branchlets silky pubescent. Leaves spirally arranged, mostly crowded on very short branchlets; glands absent; lamina coriaceous, concolorous, narrowly oblong to broadly obovate, obtuse, attenuated at the base, often decurrent on the petiole, 1.5 - 5 cm long, 0.2 - 2.5 cm wide, glabrescent early; domatia common; petioles absent or to 4 mm long with appressed pubescence. Spike andromonoecious with a few distal male flowers, silky pubescent, dense, exceeding the leaves; bracts linearly triangular, 1 - 3 mm long, sometimes persisting till anthesis. Flowers both male and perfect 4 - 5 mm long, 4 mm diam. Calyx pubescent inside and outside; lobes acuminate, triangular, 1 x 1.5 mm. Stamens with glabrous filaments to 3 mm long. Disc and Style villous. Mature fruit with two narrow lateral wings less than 2 mm wide confluent with the short beak, one or both faces with one or more horns, tubercules or irregular ridges to 4 mm high, 0.8 - 1 (-1.5) cm long, 0.4 - 0.9 cm wide, dry, green, yellow or brown, in cross section showing a well developed sclerenchymatous core containing a few alveolar cells

near the outer edge surrounded by a narrow leathery epidermis, mucilage canals absent; immature fruit not significantly different but smaller.

WESTERN AUSTRALIA: Isdell R., Sep 1921, Gardner 1590 (PERTH); Liparinga — Noonkombah, Apr 1927, Ewart (PERTH); Fitzroy R., in 1949, Mrs. Guppy L2 (PERTH); 24 miles E of Gibb R. Stn, Sep 1954, Speck 4997 (CANB, BRI); 6 miles NE of Mt Eliza, May 1905, Fitzgerald 747 (PERTH); Walcott Inlet, Aug 1905, Fitzgerald (PERTH); Kimberley, in 1938, Barnett (PERTH); Lennard R., May 1905, Fitzgerald (NSW); Kurrungi Stn, Jan 1955, Rust 76 (CANB); Kurrungi Stn, Sep 1954, Speck 5009 (CANB, BRI, PERTH); Kurrungi Stn., Mar 1952, Rust 17 (PERTH); Pentacost R. Crossing, May 1967, Byrnes 314 (DNA); Pentacost R. Crossing, May 1967, Jackson 871 (AD); 10 miles N of Bow R., Apr 1955, Lazarides 5054 (CANB, BRI, NSW, AD, PERTH); Ord R., Sep 1949, Langfield 112 (CANB, PERTH); Ord R., Oct 1906, Fitzgerald (NSW); Ord R., Jun 1944, Gardner 7301 (PERTH); Ord R., Jul 1967, Gittins 1415 (BRI, NSW, PERTH); Ord R., Sep 1969, Byrnes 1710 (DNA); Ord R., Jun 1967, Jackson (AD); 6 miles N of Kunnurra, Jul 1967, Byrnes 401 (DNA); Northern Trritory: Upper Victoria R., Dec 1855 (K - lectoparatype); Victoria R., Mueller (K — lectoparatype); East Baines R., May 1969, Bymes 1563 (DNA); Victoria R. Downs Stn, Jun 1949, Perry 2039 (CANB, BRI, NSW); 13 miles NE of Wave Hill, Jun 1949, Perry 2187 (CANB, BRI, NSW); Jasper Gorge, Feb 1970, Byrnes 1772 (DNA); Victoria R., Kununurra Rd. Crossing, Apr 1969, Byrnes 1559 (DNA); Victoria R., Top Springs Rd Crossing, May 1969, Byrnes 1584 (DNA); 56 miles SW of Katherine, Apr 1969, Byrnes 1548 (DNA); 5 miles N of Renner Springs, Feb 1968, Latz 199 (NSW, AD, NT); Nutwood Downs near Homestead, Apr 1969, Byrnes 1604 (DNA); Hodgson R., Nutwood Downs, May 1969, Byrnes 1606 (DNA); Helen Springs, Mar 1939, Baker (NSW); Balbarina Creek, 20 miles E of O.T. Downs, Mar 1959, Chippendale (BRI, NSW, NT); 83 miles S of Borroloola, Apr 1970, Bymes 1884 (DNA). QUEENSLAND; BURKE DISTRICT: Settlement Creek, Feb 1923, Brass 284 (CANB, BRI); Police Ck, Camooweal, Jul 1928, MacGillivray 2001 (BRI); Adel's Grove, Camooweal, de Lestang 74 (BRI); Lawn Hill, May 1970, Jensen 91 (BRI); 38.5 miles N of Thorntonia Stn, May 1948, Perry 1074 (CANB, BRI, NSW).

Range: Australia north of latitude 21° S but not including the eastern coastal area or Cape York Peninsula and the northern Arnhem Land of Northern Territory.

Habitat: This species is restricted to the beds, rarely banks or flood plains of permanent or seasonal creeks and rivers. The shrubs are commonly submerged during flooding and mostly lean downstream.

Observations and Notes: The distinctive fruit enables easy determination of this species but sterile material can be confused with *T. pterocarya* from which it differs by having a generally shorter petiole.

Flowering and fruiting of this species is irregular so it may be found in flower during most periods of the year. As fruit development takes a relative short period of time both fruit and flower are commonly present on most plants at the one time. In the late dry season, trees growing in close proximity to each other can be found with widely differing densities of leaf cover, some being leafless. Leaf size and shape is quite variable and a wide range may be present on the one branch.

At times large quantities of a clear gum is exuded from the trunk and branches of this species.

Mueller listed two localities in his description, Victoria River and around the Gulf of Carpentaria but no material from the latter locality could be found. The two specimens labelled Upper Victoria River are apparently the one collection and both are good flowering material. The Melbourne specimen is nominated as the lectotype. The other specimen collected by Mueller and labelled Victoria River has no mature fertile material.

5. Terminalia canescens (DC.) Radlk, in Th. Dur., Ind. Gen. Phan. 500 (1888); Pflanzenreich 4: 165: 1002 (1933); Sitzb. Akad Muench. 20: 129 (1890); Blake, Aust. J. Bot. 2: 107 (1954).

Basionym: Alectryon canescens DC., Prod. 1:617 (1824); Don, Gen. Syst. 1:675 (1831). **Type:** Nouvelle Hollande, cote. (Neither the collector nor the exact locality could be ascertained). (G-DC). Although the specimen was not sighted, photographs of the specimen leave little doubt to its identity.

Terminalia circumalata F. Muell., Fragm, 3:91 (1862); Benth., Fl. Aust. 2:499 (1864); F.M. Bail., Qd Fl. 566 (1900), Comp. Cat. Qd Pl. 180 (1913) Ewart & Davies, Fl. N. Terr. 212 (1917); Fitzgerald, J. Roy. Soc. W.A. 3 182 (1918); Gardner, W.A. For, Dept. Bull. No. 32:72 (1932). Types: Nickol Bay, in 1862, F. Gregory Expedition (MEL, K).

Shrub rarely tree to 10 m high, deciduous or semi-deciduous. Trunk and branches with longitudinally and transversely fissured bark forming persistent hard plates. Branchlets with appressed pubescence. Leaves spirally arranged, not crowded; glands inconspicuous, usually on petiole or base of lamina; lamina coriaceous, concolorous, lanceolate to narrowly oboyate, rarely elliptical, acute to obtuse, attenuate at the base, 1.5 - 10 cm long, 0.5 - 2.5 cm wide, appressed pubescent to densely sericeous, sometimes glabrescent but retaining hairs along midrib, commonly glaucous; domatia small and usually obscured by indumentum, petioles 0.3 - 3 cm, pubescent. Spike andromonoecious, male flowers restricted to distal end, appressed pubescent, dense, usually longer than the leaves; bracts lanceolate to triangular, 2 - 3 mm long, caducous. Flowers ca 4 mm diam., male 3 - 4 mm long, perfect ones 5 - 7 mm long. Calyx densely pilose outside; lobes acute to acuminate, triangular, 1.5 x 2 mm, villous inside. Stamens with glabrous filaments 3 - 4 mm long. Disc villous. Style with a few thin hairs towards the base. Mature fruit a nut, oboyate to broadly elliptical, with a distinct wing continuous around the body, 2 - 3 cm long, 1 - 1.8 cm wide including the wings, dry, pubescent or pilose, glaucous, in cross section showing a well developed sclerenchymatous core with small patches of alveolar tissue included around the outer edge, corky parenchyma present in very small isolated areas, succulent tissue and mucilage canals absent; similar but smaller when immature.

WESTERN AUSTRALIA: 30 miles E of Dampier, Nov 1971, Lullfitz (DNA); Dampier, Nov 1971, Lullfitz (DNA); Roebourne, Apr 1901, Pritzel 285 (NSW); Roebourne, Apr 1901, Diels & Pritzel 341 (PERTH); Warralong Stn, Jul 1968, Sujendorp (PERTH); Warralong Stn, May 1941, Burbidge 819 (PERTH); Derby, Apr 1905, Fitzgerald (NSW); Depuch I., May 1962, Royce 7086 (PERTH); Depuch I., May 1962, Royce 7118 (PERTH); Yarrie Stn, May 1965, Beard 4013 (PERTH); Mt Agnes, Jun 1921, Gardner (PERTH); 50 miles E of Broome, May 1967, Byrnes 368 (DNA); Fitzroy R. Crossing, in 1942, Guppy X2 (PERTH): 24 miles W of Langleys Crossing, Fitzroy R., May 1967, Maconochie 242 (BRI, NT): Fitzroy Crossing, in 1949, Guppy H11 (PERTH); 48 miles SSE of Kalumburu Mission, Sep 1954, Speck 4866 (CANB); 35 miles S of Kalumburu Mission, May 1971, Byrnes 2314 (DNA); 5 miles W of Theda Stn, May 1971, Byrnes 2286 (DNA); Kittys Gap, E of Eginbah, June 1941, Burbidge 988 (PERTH); Kurrungi Stn Jan 1955, Rust 90 (CANB); 7 miles N of Bow R., Apr 1955, Lazarides 5056 (CANB, NSW, AD, PERTH); 50 miles N of Kununurra, Oct 1970, Byrnes 2010 (DNA). NORTHERN TERRITORY: 60.4 miles N of Top Springs, Sep 1957 Chippendale (AD, PERTH, NT); Victoria R. Kununurra Rd Crossing, Apr 1969, Byrnes 1557 (DNA); Victoria R., Apr 1969, Byrnes 1558 (DNA); 1 mile W of Jump Up, Murrunji S.R., Sep 1957, Chippendale (BRI, NSW, NT); Litchfield, Dec 1963, Muspratt SSO 452 (DNA); 103 miles SW of Katherine, Nov 1968, Byrnes 1176 (DNA); Plum Tree Creek, Apr 1969, Byrnes 1510 (DNA); 10 miles N of Mataranka, Feb 1965, Wilson 277 (CANB, NSW); 5 miles N of Larrimah, Mar 1955, Winkworth 110g (BRI); 3 miles S of Larrimah, Feb 1969, Byrnes 1352 (DNA); Birdum, Nov 1964, Blake (CANB, BRI); 205 miles S of Katherine, Nov 1968, Byrnes 1176 (DNA); ca 10 miles N of Elliott, Apr 1970, Byrnes 1893 (DNA); 25 miles N of Elliott, Jan 1968, Latz 94 (NSW, AD, PERTH, NT); Powell Creek, Holtze (MEL); Nutwood Downs, May 1947, Blake 17564 (CANB, BRI); Nutwood Downs Homestead, May 1969, Byrnes 1600 (DNA); 50 miles E of Stuart Hgy, Borroloola Rd, Apr 1970, Byrnes 1844 (DNA); October Creek, Apr 1970, Byrnes 1846 (DNA); 150 miles E of Stuart Hgy, Borroloola Rd, Apr 1970, Byrnes 1846 (DNA); MacArthur River, Jul 1969, Gittins 1342 (BRI, NSW); Settlement Ck, in 1922, Brass (CANB); Settlement Ck, Jan 1922, Brass 111 (CANB, BRI). Oueensland: Burke District 12 miles SE of Westmoreland Stn, Jun 1948, Perry 1354 (CANB, NSW); 52 miles N of Lawn Hill, Jun 1948, Perry 1134 (CANB); Sweers I., Aug 1904, Bailey (BRI, NSW).

Range: Tropical Australia north of latitude 22° S and west of longitude 141° E.

Habitat: Skeletal or desert soils of a sandy nature and dry or well drained soils regardless of parent material.

Observations and Notes: The affinity of this species with *T. pterocarya* is discussed under that species.

Flowering occurs with the new growth usually early in December and may continue for several months. Mature fruit can be found from February and may persist on the plant throughout the dry season. On some trees the fruits are so numerous and similar in colour to the leaves that they can be mistaken for the foliage at a distance. The plants are deciduous in the drier localities but in some favoured areas may retain some leaves until after the new growth appears.

Mueller's name, *T. circumalata* has been widely used for this species as it occurred in all Australian literature until S.T. Blake drew attention to the nomenclature change in 1954. *T. canescens* Engler, Pflazenw. Ost Afr., C 294 (1895), applied to an African species is illegitimate as it is a later homonym of *T. canescens* (DC) Radlk. in Durand (1888) (see Griffiths, Linn. Soc., (Bot.) 55: 904. (1959).

6. Terminalia pterocarya F. Muell., Fragm. 2:152 (1861); Ewart & Davies, Fl. N. Terr. 213 (1917); Specht & Mountford, Am.-Aust. Sc. Exp. to Arnhem Land 3:266 (1958). Type: 'Arnhem' Land, F. Mueller (K, holo).

Terminalia 'pterocarpa' F. Muell. ex Benth., Fl. Aust. 2:500 (1864); F.M. Bail., Qd Fl. 2003 (1900), Comp. Cat. Qd Pl. 180 (1913). (Orthographic variant).

Shrub to 7 m high, deciduous. **Trunk and Branches** with longitudinally and transversely fissured bark producing hard plates. **Leaves** spirally arranged, rarely crowded; glands sometimes present on petioles or lower lamina; lamina subcoriaceous, concolorous, broadly elliptical to obovate, obtuse to retuse, attenuate at the base, 1.5 - 5.5 cm long, 0.6 - 3 cm wide, glabrous or with scattered thin and fragile hairs; domatia present; petioles thinly pubescent at first, glabrescent, 0.3 - 1.4 cm long. **Spike** andromonecious with male flowers usually restricted to the distal end, appressed pubescent, dense or interrupted, about as long as the leaves; bracts narrowly triangular to spathulate, 2 - 3 mm long, caducous. **Flowers** ca 5 mm diam., male 4 - 6 mm long, perfect ones 6 - 9 mm long. **Calyx** tube pubescent; lobes triangular, 1.5 x 2 mm, acuminate, scattered short hairs outside, glabrous or with long thin hairs, inside.

Stamens with glabrous filaments ca 4 mm long. Disc villous. Style with a few long thin hairs towards the base. Mature fruit elliptical to broadly elliptical with a wing continuous around the body, 2 - 3.6 cm long, 1 - 2 cm wide including the wing, dry, glabrous or with a few scattered short fragile hairs, light green to yellow-brown, in cross section showing a well developed 2 - 5 - angled core of sclerenchymatous tissue with small areas of dry parenchyma tissue outside, alveolar tissue absent or a very few isolated cells, mucilage canals absent; similar but smaller and deeper green often with the flower remanents at the apex when immature.

Northern Territory: Claravale Stn, May 1964, Robinson R467 (DNA); Delissaville, Mar 1948, Specht 78 (BRI); Port Darwin, in 1885, Holtze (MEL); Nightcliff Rd, Darwin, Mar 1958, Eddy (NSW); Holmes Jungle Rd, Jan 1969, Byrnes 1287 (DNA), Apr 1969, Byrnes 1635 (DNA); 60 miles 120° Darwin, Aug 1965, Story 7780 (CANB); 89 miles 95° Darwin, Jul 1965, Story 7756 (CANB); Shoal Bay, May 1970, Byrnes 1937 (DNA); Marraki Crossing, Jul 1964, Robinson R702, (DNA); Brocks Creek, Jul 1946, Blake 16432 (CANB, BRI); Edith R. Siding, Feb 1965, Wilson 306 (CANB); Edith Falls, Mar 1970, Byrnes 1838 (DNA); Edith R., May 1969, Byrnes 1631 (DNA); 59 miles SW of Katherine, Apr 1969, Byrnes 1547 (DNA); 11 miles W of Katherine, Mar 1965, Wilson 383 (BRI); 17 miles SW of Katherine, Jun 1963, Barlow (BRI); 16 miles SE of Katherine, Dec 1963, Lazarides 6996 (CANB, BRI, NSW, AD, PERTH); 8 miles SE of Katherine, Feb 1961, McKee (BRI, NSW); Katherine, Lazarides & Adams 81 (CANB, NSW); Knuckey Creek, Katherine, May 1964, Muspratt R503 (DNA); 16 miles E of Katherine, Jan 1965, Wilson 112 (CANB, BRI) Daphne Creek, Jan 1967, Byrnes 122 (DNA); Stuart Hgy, near Maranboy Turnoff, Dec 1964, Schneider (AD); Oenpelli, Sep 1948, Specht 1090 (CANB, BRI, NSW, AD, PERTH); Hemple Bay, Groote Eylandt, Apr 1948, Specht 324 (BRI, NSW, AD); Settlement Ck, Feb 1923, Brass (BRI); in 1891, Holtze 1212 (MEL).

Range: Northern Territory north of latitude 16° S and along the coastal areas and on the neighbouring islands of the southern shore of the Gulf of Carpentaria.

Habitat: Alluvial and sandy soils often in the vicinity of rivers and creeks or on poorer soils in the high rainfall areas.

Observations and Notes: As noted by Bentham this species is very closely allied to *T. canescens* but differs in having wider, glabrous, rarely glaucous leaves with more distinct venation and by the absence of patches of alveolar tissue in the fruit. Both species are often found in the same locality with *T. canescens*, usually in the drier situations. Some intermediate forms have been found which may be hybrids but they are generally more closely related to *T. canescens*.

Flowering continues over a considerable period of the rainy season and as the fruit develops quickly, flowers and all stages of fruit development may be found on the one plant at the one time.

No specimen could be found in Melbourne and only one collection was referred to in the description, this being collected by the author, so this specimen can be considered as the holotype. Arnhem Land (with various spellings) was used by Mueller on his specimens to cover a wide area of Northern Australia and included the Victoria River and South Alligator (River) Creek (not S. Alligator R. as now understood) given as the type locality in the description of the species. The type is mounted on a sheet with a collection made by R. Brown (no locality but with Bennet No. 4459) which Mueller would not have seen.

In transcribing the name Bentham recorded the species as T. 'pterocarpa', a mistake which was followed by Bailey and found its way on to numerous herbarium sheets.

Terminalia pterocarpa Melville & Green, Kew Bull. 23:337 (1969), is applied to a Fijian species which is not related to nor should be confused with the Australian species.

7. Terminalia arostrata Ewart & Davies, Fl. N. Terr. 212 et 372 (1917) Type: Hodson Downs Nutwood Downs McMinns Bar, Roper River N.T., 7 Apr 1912, G.F. Hill 834 (MEL, holo; NSW, iso)

Terminalia rogersii W.V. Fitzg., Proc. Roy. Soc. W.A. 3:185 (1918) **Type:** Denham River, Oct 1906, W.V. Fitzgerald 1633 (PERTH, NSW).

Tree to 12 m high, deciduous or semi-deciduous. Trunk with deeply fissured, tessellated, grey bark. Young branches and branchlets markedly pendulous, the latter slender, sympodial, pubescent at first, glabrescent early. Leaves spirally arranged, sometimes crowded; glands present on petioles, rarely on lamina; lamina subcoriaceous, concolorous, narrowly or broadly oboyate, very obtuse or rarely retuse, markedly attenuated at the base, (2 -) 3 - 8 cm long, (1 -) 1.5 - 3 cm wide, glabrous or with a few scattered hairs; domatia small and usually irregularly distributed; petioles glabrescent, 0.8 - 3 cm long. Spike andromonoecious with a few perfect flowers near the base, glabrous or with a few scattered hairs, interrupted, as long as or exceeding the leaves; bracts linearly triangular, 1.5 - 2 mm long, caducous, Flowers both male and perfect ca 5 mm diam., 3 - 7 mm long. Calyx glabrous outside; lobes deltoid, 2 x 2 mm, sparingly villous inside. Stamens with glabrous filaments 3 mm long. Disc villous. Style glabrous. Mature fruit globular, smooth (flesh often splitting irregularly), almost or quite beakless, (1.5-) 2 - 2.5 cm diam., succulent, dark purple or black, in cross section showing a well developed sclerenchymatous core with radiating rays between areas of alveolar tissue, both sclerenchyma and alveolar tissue constituting 80 per cent of the diameter, and being surrounded by a ring of succulent tissue containing numerous mucilage canals; green, shortly beaked, commonly with 3 - 7 obscure angles when immature.

WESTERN AUSTRALIA: Nicholson R., May 1944, Gardner 7218 (PERTH); 18° 30'S, 128° 40'E, Jul 1967, Gittins 1400 (BRI, NSW); ca 20 miles N of Kununurra, Oct 1970, Byrnes 2012 (DNA). NORTHERN TERRITORY: Timber Ck, Feb 1961, Gordon (AD); Sandy Ck, Fitzroy Stn, Feb 1970, Byrnes 1756 (DNA); Kidman Springs, Feb 1970, Byrnes 1758 (DNA); 46 miles SW of Birrimbah Outstation, Jun 1949, Perry 2074 (CANB); 41 miles SW of Birrimbah Outstation, Jun 1949, Perry 2072 (CANB); Willeroo, Feb 1970, Byrnes 1752 (DNA), Apr 1969, Byrnes 1551a (DNA) and Jan 1970, Harpley (DNA); 4.5 miles N of Top Springs, Oct 1958, Chippendale (BRI, NSW, NT); 2 miles W of Pussycat Bore, Murranji Stock Route, Jul 1956, Chippendale (BRI, NSW, NT); Mucaty, Mar 1965, Chippendale (CANB, BRI, NT); Mucaty & Helen Springs, Jul 1947, Perry 197a (CANB); 6 miles N of Helen Springs, Aug 1948, Perry 1910 (CANB, BRI, NSW); 7 miles S of Renner Springs, Feb 1971, Harpley (DNA); 1 mile S of Renner Springs, Apr 1970, Byrnes 1892 (DNA).

Range: North-eastern Kimberley region of Western Australia and Northern Territory between the 14° S and 20° S latitudes, and 127° E and 136° E longitudes.

Habitat: Common on or around the fringes of black soil plains, on undulating soils of basaltic origin or on river or creek levee soils. Often this species forms an open savannah woodland either in pure stands or in association with *T. wolucris* or *Eucalyptus papuana* F. Muell. Isolated trees are sometimes found on the blacksoil grass plains.

Observations and Notes: *T. arostrata* is normally deciduous with the leaf density declining as the dry season progresses but in some favourable locations some foliage may be retained until the new leaves appear. The flesh of the fruit is edible but acid to taste and the kernel is sometimes eaten. It is known locally as "nutwood". Distorted galled fruit are common and are due to attack by a species of Eriophydae.

This species has affinity to *T. grandiflora, T. savannicola* and *T. cunninghamii* but it differs from them by the fruit being beakless when mature. The flowers are much smaller than those of *T. grandiflora* and the fruit is smaller and the branchlets more slender and pendulous than those of *T. cunninghamii*. The relationship with *T. savannicola* is apparently much closer but the narrower leaves combined with the fruit characters is sufficient to separate the species.

The name *T. arostrata* (published 1917) has priority over *T. rogersii* (published 1918). The types of *T. arostrata* and *T. rogersii* are a good match for each other and the reason for publication of both names was that both authors prepared their description unaware of the others work on the species. The drawings in Ewart & Davies, Fl. N. Terr., were based on the Melbourne specimen indicating that this specimen is the holotype.

8. Terminalia grandiflora Benth., Fl. Aust. 2:503 (1864); F. Muell., Fragm. 9:160 (1875); F.M. Bail., Qd Fl. 568 (1900), Comp Cat. Qd Pl. 180 (1913); Ewart and Davies, Fl. N. Terr. 212 (1917); Fitzgerald, J. Proc. Roy. Soc. W.A. 3:185 (1918); Gardner, W.A. For. Dept. Bull. No 32:74 (1923); Specht & Mountford, Am.-Aust. Sc. Exp. to Arnhem Land 3:265 (1958). Type: Arnheim S. Bay (Caledon Bay), 4 Feb 1803, R. Brown (lectotype, BM).

Tree to 15 m high, deciduous. Trunk and Branchlets with grey tessellated bark often deeply fissured. Young branchlets with a short appressed pubescence, commonly sympodial. Leaves spirally arranged, mostly crowded; glands absent; lamina subcoriaceous, concolorous, narrowly elliptical or oblong to narrowly obovate, obtuse to retuse, attenuated at the base, 4-12(-15) cm long, (0.5-) 1-2 cm wide, with an appressed silky indumentum when young, mostly glabrescent; domatia present, irregularly distributed; petioles sericeous at first, usually glabrescent, 0.5-1cm long. Spike andromonoecious with mostly male flowers, interrupted, pilose or with scattered thin hairs, commonly exceeding the leaves; bracts linearly triangular, 1-2 mm long, caducous. Flowers ca 0.8 cm diam., 1.5-2 cm long including the stamens. Calyx appressed pubescent to thinly pilose outside; lobes deltoid, sometimes shortly acuminate, 2 x 2 mm, villous inside. Stamens with glabrous filaments, 1-1.5 cm long. Disc villous. Style glabrous. Mature fruit glabrous, globular or ovoid, without angles or ridges, with a distinct beak, ca 2.5 cm diam., 3-4 cm long, succulent, purple, in cross section showing a well developed sclerenchymatous core with radiating arms between areas of alveolar tissue, sclerenchymatous and alveolar tissue together constituting approximately 80 per cent, of the diameter, the remainder being a surrounding ring of succulent tissue containing numerous mucilage canals; obscurely angled (usually two), green and smaller when immature.

WESTERN AUSTRALIA — Broome District, Jan 1933, Wise (PERTH); Isdel R., Jun 1905, Fitzgerald 1047 (PERTH); Isdel R., Sep 1905, Fitzgerald 1516 (PERTH); 52 miles N of Obelisk, Jun 1937, Stokes 41

(PERTH); 72 miles NNW of Gibb R. Stn, Sep 1954, Speck 4964 (CANB, BRI, NSW, PERTH); Carson R., Aug 1920, Gardner 1553 (PERTH); Nicholson Stn, Halls Creek, Jul 1967, Gittins 1400 (PERTH); Kurunjie Stn, Mar 1952, Rust 8 (PERTH); Kurunjie Stn, Oct 1954, Rust 48K (CANB); Kurunjie Stn, Oct 1954, Rust 15K (CANB); Kimberley Research Stn, Mar 1955, Rust 111 (CANB); Kununurra Research Stn, Mar 1952, Langfield 277 (CANB, PERTH). NORTHERN TERRITORY: 7 miles NE of Legume Stn, Jul 1949, Perry 2587 (CANB, BRI, NSW); between Victoria R. & Fitzmaurice, Oct 1855, Mueller (lectoparatype, MEL), Douglas - Daly R. Junction, Sep 1962, Muspratt SS067 (BRI, DNA); Litchfield, Dec 1963, Muspratt SSO450 (DNA); 23miles SW of Dorisvale Stn, May 1952, Perry 2780 (CANB); 23 miles NE of Tipperary, Aug 1961, Lazarides 6689 (CANB, NSW, PERTH); Bachelor Farm, Jul 1914, Allen (NSW); Darwin, Bleeser 778 (BRI); 14 miles SE of Darwin, Sep 1970, Byrnes 1990 (DNA); 90 miles 85° Darwin, Jul 1965, Story 7754 (CANB); 12° 40'S 131° 25'E, Sep 1946, Blake 16993 (CANB, BRI); Brocks Ck, Jun 1946, Blake 16231 (CANB, BRI); Ooloo Rd., 4 miles from Hgy, Jun 1964, Robinson R592 (DNA); 35 miles W of Katherine, Apr 1969, Byrnes 1549 (DNA); 12 miles W of Katherine, Aug 1961, Lazarides 6625 (CANB, NSW); 10 miles S of Katherine, Apr 1956, Burbidge 5075 (CANB); 15 miles SE of Katherine, Aug 1963, Adams 819 (CANB, BRI, NSW); Katherine, May 1969, Byrnes 1990 (DNA); 18.4 miles S of Mataranka, Sep 1957, Chippendale (NSW, AD, PERTH, NT); Stuart Hgy 278 miles, Jul 1974, Robinson R771 (DNA); 34 miles E of Birdum, Sep 1947, Perry 406 (CANB); 58 miles ENE of Carlton Downs Stn, Sep 1954, Speck 4964 (CANB, BRI, NSW); Mudginberry, Sep 1970, Byrnes 1974 (DNA); Oenpelli, Dec 1972, Beens & Spence (BR1); Oenpelli, Oct 1948, Specht 1153 (CANB, BRI, NSW, AD, PERTH); Port Essington, Armstrong (lectoparatype, K); Black Pt, Sep 1968, Byrnes 1008 & Maconchie (NSW, AD, NT); Yirrkala, Sep 1948, Specht 1026 (CANB, BRI, AD); Carpentaria, mainland opposite Groote Island, Jan 1803, Brown (lectoparatype, BM); South Bickerton I, Oct 1948, Specht 1153 (CANB, BRI); Bickerton I., Jun 1948, Specht 545 (NSW); Arnhem Land, Mueller (lectoparatype, K);

Range: Western Australia and Northern Territory north of latitude 18°S.

Habitat: In mixed *Eucalyptus* forests on deeper lateritic podsols, basaltic or levee soils.

Observation and Notes: This species is distinct from all other Australian species having much larger flowers but it has affinity with *T. arostrata* (see discussion under that species) and with *T. cunninghamii* which has a larger but similar fruit and is mostly glabrous.

By the end of July the trees are nearly leafless and flowers are produced with the new leaves usually early in September. Fruit may mature as early as December but are usually retained by the tree for several months.

The tree is known as Plumwood or Nutwood and the kernel is eaten by the Aborigines.

Of the syntypes Bentham sighted, the Brown specimens closely match the description. As the emphasis is on the flowering material, then the flowering specimen of the two mounted on the one sheet was selected as the lectotype. The collection site of the specimen was decided by use of Brown's reference to the stamens in his notes combined with the date of collection and the log of the expedition.

 Terminalia fitzgeraldii C.A. Gardner, W.A. For. Dept. Bull. No. 32: 79 (1923), ("fitzgeraldi"). Type: Walcott Inlet, Kimberley, W.A., 21 Sep 1922, C.A. Gardner 1584 (PERTH holo; NSW, iso).

Tree or shrub to 8 m high, deciduous. Trunk and branches with brown-grey or dark grey, deeply tessellated or longitudinally furrowed bark. Branchlets usually pendulous, at first with appressed pubescence, glabrescent, rarely sympodial. Leaves

spirally arranged, not crowded; glands inconspicuous, common on pedicles, rare on lamina; lamina coriaceous, concolorous, ovate to broadly ovate or elliptical, rarely obovate, acute to very obtuse, usually shortly attenuate at the base, often narrowly decurrent, 5-10 cm long, 3-7 cm wide, appressed velutinous when young but soon or eventually glabrescent; domatia distinct mainly along midvein but often with a few scattered along primary veins; petioles glabrescent, (1.5-) 2-5 cm long. Spike male or andromonoecious with a few perfect flowers near the base, velutinous or with scattered hairs, interrupted, mostly shorter than the leaves; bracts linearly triangular 0.5-2 mm long, caducous. Flowers both male and perfect ca 4 mm long, 5 mm diam. Calyx glabrous or thinly villous; lobes triangular ca 1.5 x 1.5 mm, villous or rarely glabrous inside. Stamens with glabrous filaments, 2-4 mm long. Disc villous. Style glabrous, Mature fruit glabrous, ovoid, usually, with a prominent thick beak, without angles or ridges, 2.4-3.5 cm long, 2-3 cm diam., succulent, dark purple, in cross section showing a well developed sclerenchymatous core of variable shape and size with pockets of alveolar tissue irregularly distributed around the outside, all being surrounded by a ring of amorphous succulent tissue containing several mucilage canals; smaller, green, similar in shape but with a more clearly defined beak and obscure angles (usually two) when immature.

WESTERN AUSTRALIA: 16 miles SE of Kalumburu Mission, Sep 1954, Lazarides & Speck 4880 (CANB, PERTH); 10 miles S of Kalumburu, May 1971, Bymes 2296 (DNA); Gordon Downs, Sep 1950, Royce 3331 (PERTH); 60 miles N of Kununurra, Oct 1970, Byrnes 2008 (DNA). Northern Territory: Willeroo, Dec 1970, Morgan 25 & 26 (DNA); Daly R. Plains near Police Stn, Oct 1962, Muspratt SS042 (NSW, DNA); Kilfoyle Plains, Nov 1966, Byrnes 4 (DNA); 7 miles NW of Tipperary Homestead, Oct 1962, Muspratt SS0385 (DNA); Reynolds R., May 1969, Byrnes 1630 (DNA); Reynolds R., Daly R. Rd, Dec 1968, Byrnes 1246 (DNA), May 1969, Byrnes 1630a (DNA), Feb 1970, Byrnes 1714 (DNA) and Jan 1967, Byrnes 151 (DNA); Jaberoo Plains Meneling Stn, Jan 1965, Robinson 2936 (DNA); Elizabeth R., Dec 1968, Byrnes 1251 (DNA); Elizabeth R., Sep 1970, Byrnes 1992 (DNA); Humpty Doo, Jan 1964, Robinson R. 156 (DNA); Brocks Ck, Jul 1946, Blake 16479 (CANB, BRI).

Range: Kimberley area of Western Australia and the north western area of Arnhem Land, Northern Territory.

Habitat: Heavy clay plains which are seasonally inundated but seldom to a great depth.

Observations and Notes: The great range of variation in this species often exhibited on the one tree at times makes it difficult to separate this species from its close relatives but the combination of the broad, usually ovate, distant leaves with their large domatia and the thick beak on both mature and immature fruit distinguishes it.

The trees usually lose their leaves in September and the new growth follows quickly with the subsequent development of flowers. Flowering continues for several months with the first fruit maturing by January. The fruit is usually retained by the tree for several months during which time the succulent tissue splits allowing fungal and insect attack. The succulent tissue is edible but acid and the kernel is sometimes eaten by aborigines. Sucker growth is common in areas of annual burning and although these plants seldom exceed one metre in height they often flower giving rise to a larger number of male spikes.

Only two specimens of the type material are known. The Perth specimen is labelled type on the original Forests Department label with the species name. The N.S.W. sheet had the specific name added at a later date and not by Gardner.

Terminalia cunninghamii C.A. Gardner, W.A. For. Dept. Bull. No. 32:73 (1923), Type: Vansittart Bay, Kimberley, 19 Aug 1921, C.A. Gardner 1536, (PERTH, holo).

Tree to 8 m high, deciduous. Trunk and branches with deeply fissured grey bark. Branchlets markedly thickened at the crowded nodes, glabrous, commonly sympodial. Leaves spirally arranged, crowded on short thick or longer sympodial branchlets; glands on petiole or base of lamina or rarely on the primary veins, lamina coriaceous, concolorous, oblanceolate, obtuse rarely retuse, markedly attenuated at the base, 2.5-11.5 cm long, 0.7-5 cm wide, glabrous; domatia present; petioles thinly pubescent at first, glabrescent early, 0.3-1 (-1.2) cm long. Spike andromonoecious with a few perfect flowers near the base, glabrous, interrupted, as long as or exceeding the leaves; bracts narrowly triangular, 1-2.5 mm long, caducous. Flowers both male and perfect ca 4 mm diam., 3-8 mm long. Calyx glabrous outside; lobes ovately triangular, 3 x 3 mm, sparingly pubescent inside. Stamens with glabrous filaments, ca 4 mm long. Disc and Style villous. Mature fruit glabrous, globular or ovoid with a distinct short beak, ca 4 cm long, 3.5 cm diam. (old dry fruit only observed), succulent, smooth, in cross section showing a well developed sclerenchymatous core containing numerous spaces (mucilage filled?) and surrounded by areas of alveolar tissue, the sclerenchyma and alveolar tissue together about 3 cm in diam., all being surrounded by succulent tissue (detail structure unknown): immature fruit not seen.

WESTERN AUSTRALIA: Wallal, Dec 1932, Spry (PERTH); Telegraph line, N of Radi Hills, May 1965, Beard 4042 (NSW, PERTH); Mitchell Plateau, Kimberley, Jun 1971, Byrnes 2320 (DNA); 55 miles S of Kalumburu, Jun 1971, Byrnes 2315 (DNA) Kalumburu, May 1970, Byrnes 2306 (DNA) and May 1970, Byrnes 2310 (DNA).

Range: Western Kimberley area of Western Australia near the coast between the Drysdale River and the Eighty Mile Beach. From present collection it appears that the species occurs in isolated pockets within 100 km of the coast.

Habitat: Flat sandy areas generally associated with sandstone formations.

Observations and Notes: Due to the limited material so far available (seven collections in all) this species is not well known. The type material was collected in August and was in flower and the fruits apparently mature and fall early in the wet season, but in southern areas flowering appears to be irregular. Dry fruits were found on the ground in May and with only three exceptions all signs of succulent tissue had disappeared. These three indicated that fresh mature fruits would be the largest of the Australian species except *T. catappa*. It is known as "Pindan Quandong".

The markedly swollen branchlets in the area of the crowded nodes, particularly on the sympodial branchlets, is a valuable character in the determination of the species.

Only one herbarium sheet of the type material is known.

11. Terminalia savannicola N. Byrnes sp. nov. Type: 17 miles SW of Willeroo, 19 Jan 1971, N. Byrnes 2024. (Holotype: CANB 216181; isotypes: NSW, BRI, K, L, NT, DNA).

Arbor decidua ad 10 m alta. Truncus cortice profunde fissuata. Ramulus glaber. Surculus juvenis pubescentia appressa. Folia spiraliter disposita vel rare conferta. Lamina folii coriacea concolora late obovata domatiis apice obtusa ad retusa et basi valde augustata 5.5-16 cm longa, 2.5-10 cm lata glabra. Petiolus glabratus 2-5 cm longus glandibus praeditus. Spica andromonoecia interrupta follis longiora vel ea aequantes prope basi floribus perfectis instructa. Bracteae lineares vel lanceolatae caducae. Lobi calycis deltati 3 x 3 mm extra glabri et intra parce villosi. Filamentum staminis glabrum 2-4 mm longum. Discus villosus. Stylus glaber. Fructus glaber globosus vel leviter compressus plerumque angulis duodus lateralibus rostellatus 3-3.5 cm longus 2-2.5 cm diam. ater et succulentus ubi maturus vel compressus parcis duobus distinctis lateralibus ubi immaturus.

Tree to 10 m high, deciduous. Trunk with deeply fissured bark. Branchlets at first with appressed pubescence, glabrescent early, sometimes sympodial. Leaves spirally arranged, rarely crowded; glands common on petioles but inconspicuous; lamina coriaceous, concolorous, broadly oboyate, obtuse to retuse, markedly attenuate at the base, 5.5-16 cm long, 2.5-10 cm wide, glabrous; domatia present; petioles glabrescent, 2-5 cm long. Spike andromonoecious with perfect flowers near the base, interrupted, as long as or exceeding the leaves; bracts linear or lanceolate, ca 1 mm long, caducous. Flowers 6-8 mm long; 7 mm diam. Calyx glabrous outside; lobes deltoid, 3 x 3 mm, sparingly villous inside. Stamens with glabrous filaments, 2-4 mm long, Disc villous. Style glabrous, Mature fruit glabrous, globular or sometimes ovoid, commonly slightly compressed with two lateral angles, shortly beaked, 3-3.5 cm long, 2-2.5 cm diam., black and succulent, in cross section showing a well developed sclerenchymatous core with small or large areas of alveolar tissue around the outer edge, both together constituting approximately 80 per cent, of the diameter and being surrounded by a ring of succulent tissue containing mucilage canals; green, compressed with two distinct lateral ridges when immature.

Northern Territory: Mistake Creek, Aug 1970, Robinson 77 (DNA); 16 miles W of Willeroo, Jan 1971, Bymes 2189 (DNA) and Apr 1971, Bymes 2078 (DNA); 12 miles W of Willeroo, Wyndham Rd., Feb 1970, Bymes 1755 (DNA); 4 miles S of Willeroo Jun 1949, Perry 2022 (CANB); Willeroo, Feb 1970, Harpley (DNA) and Apr 1969, Bymes 1551 (DNA); 4 miles E of Willeroo, Feb 1970, Bymes 1774 (DNA); N of Nutwood Downs, May 1969, Bymes 1601 (DNA); Roper Stn, Airstrip, May 1969, Bymes 1610 (CANB, BRI, NT, DNA, K); 30 miles W of Roper Bar, May 1969; Bymes 1627 (DNA).

Range: Northern Territory between latitudes 15°S and 18°S. This species will probably be found in Western Australia and Queensland.

Habitat: Rare on plains of basaltic origin or alluvial sandy soils generally associated with *T. arostrata*.

Observations and Notes: For the affinities of this species see the notes under *T. arostrata*. The similarity of this species to *T. arostrata* with which it usually grows and its comparative rarity contributed to its late discovery.

The trees flower during the wet season and only a few fruit mature because of insect damage in the early stages of development. Mature fruit may be found late in the wet season.

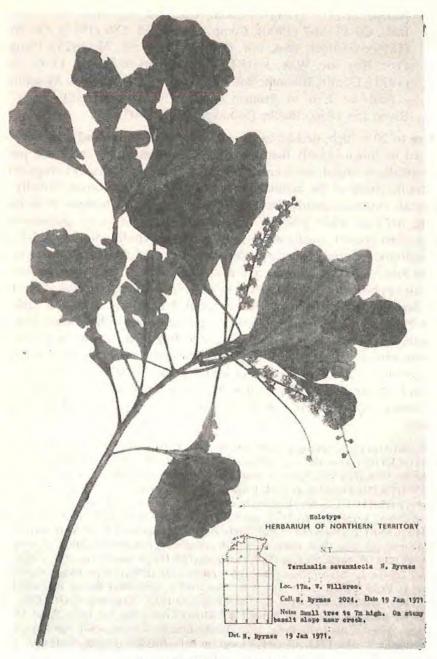


Figure 2. *Terminalia savannicola* Holotype

12. Terminalia platyphylla F. Muell., Fragm. 2:150 (1861), Landsb. Explor. Aust. 115 (1867?); Benth., Fl. Aust. 2:502 (1864); Palmer, Proc. Roy. Soc. N.S.W. 17:104 (1884); Maiden, Usef. Nat. Pl. Aust. 606 (1889); F.M. Bail., Qd Fl. 567 (1900), Comp. Cat. Qd Pl. 180 (1913), Qd Woods 64 (1899); Gardner, W.A. For. Dept. Bull. No 32:73 (1923); Fitzgerald, J. Proc. Roy Soc. W.A. 3:184 (1918); Ewart & Davies, Fl. N. Terr. 213 (1917); Domin, Biblioth. Bot. 89:1001 (1928); Specht & Mountford, Am. - Aust. Sc. Exp. to Arnhem Land 3:331, 465 (1958). Type: Victoria River, Jan 1856, Mueller (lectotype: MEL 1005508).

Tree to 20 m high, deciduous or semi-deciduous. Trunk and branches with grey tessellated or longitudinally fissured bark. Branchlets pubescent, often pendulous. Leaves spirally arranged, sometimes crowded; glands on petioles and irregularly distributed on the veins of the lamina; lamina coriaceous, discolorous, broadly oboyate to elliptical, sometimes nearly circular, obtuse, attenuated or truncate at the base, 7-19 cm long, 3-13 cm wide, pilulose, glabrescent above but rarely glabrescent below; domatia when present usually along primary veins; petioles pilulose, 1.5-7 cm long. Spike andromonoecious, pubescent, dense, shorter than the leaves; bracts triangular, ca 1 mm long, caducous. Flowers ca 5 mm diam., male 3-5 mm long, perfect 5-7 mm long. Calyx pubescent outside, lobes deltoid, 1.5 x 1.5 mm, glabrous or thinly villous inside. Stamens with glabrous filaments about 4 mm long. Disc and Style villous. Mature fruit glabrescent, oblong to broadly spindle shaped with a distinct beak of varying length, 0.7-1.5 cm diam., 2-4 cm long including beak, purple, succulent, in cross section showing a well developed very broadly spindle shaped sclerenchymatous core surrounded by a ring of alveolar tissue both together constituting 90 per cent, of the diam., and surrounded by a ring of succulent tissue containing several mucilage canals; green, smaller and sometimes with two lateral ridges for part of its length when immature.

WESTERN AUSTRALIA: Ooloogooma Stn, Derby, Apr 1970, Schneider (AD); May R., May 1905, Fitzgerald 434 (PERTH); Lennard R., Apr 1921, Gardner (PERTH), May 1905, Fitzgerald 433 (NSW) and Oct 1921, Gardner 1614 (PERTH); Fitzroy Crossing, in 1949, Guppy (PERTH); Fitzroy Crossing, Aug 1950, Royce 3250 (PERTH), Oscar Ra, in 1924, Whitlock (PERTH); 20 miles E of Noonkanbah Stn, May 1944, Gardner 7112 (PERTH); 148 miles E of Derby, Apr 1967, Power 377 (PERTH); Margaret R., May 1967 Byrnes 398 (DNA); Gogo Stn, May 1927, Ewart (PERTH); 62 miles S of Kalumburu Mission, Aug 1954, Speck 4840 (CANB); 2.5 miles NW of Elgie Cliffs, Apr 1955, Lazarides 5089 (CANB, BRI, PERTH); 35 miles S of Kununurra, May 1969, Byrnes 1568 (DNA); Kimberley Research Stn, Jan 1952, Langfield 245 & 249 (CANB, PERTH) North West, in 1917, Lanepoole (PERTH); Kimberley, in 1911, Joberg 57 (NSW). NORTHERN TERRITORY: Timber Creek, May 1969, Bymes 1571 (DNA); Jasper Gorge, Sep 1969, Bymes 1717 (DNA); Victoria River Downs, Jun 1949, Perry 2092 (CANB, BRI); Barren Places on Fitzmaurice [R.], Oct 1885, Mueller (lectoparatype, K); Top Springs, Oct 1957, Chippendale (CANB, BRI, NSW, NT); 116 miles SW Katherine, Apr 1969, Bymes 1555 (DNA); Fitzroy Stn, Feb 1970, Bymes 1773 (DNA); Scotts Creek, Willeroo, Jun 1970, Byrnes 1925 (DNA); King R., Kununurra Rd, Apr 1969, Byrnes 1541 (DNA); Katherine R., Mar 1923, Allen (NSW), and Jan 1943, Hely 245 (CANB); 8 miles SW of Katherine, June 1949, Perry 1972 (CANB, BRI, NSW, PERTH); Edith R., Jan 1968, Latz 66 (BRI, AD, PERTH, NT); Brocks Creek, Jul 1946, Blake 16373 (BRI); 14° 45'S, 131° 46'E., Oct 1946, Blake 19158 (BRI); 124 miles 106° Darwin, Jul 1965, Story 7697 (CANB); Ooloo Stn, Nov 1968, Byrnes 1195, (DNA) Mt Bundy, Apr 1969, Byrnes 1490 (DNA); South Alligator R., Apr 1969, Byrnes 1533, (DNA); 30.7 miles E of Birdum, Aug 1947, Perry 404 (CANB); Mataranka — Roper R., Mar 1969, Byrnes 1471 (DNA); Roper River, near mouth, May 1969, Byrnes 1618 (DNA); Nutwood Downs, May 1969, Byrnes 1605 (DNA); 40 miles NE of O.T. Downs Aug 1948, Perry 1858 (CANB, BRI); Borroloola, in 1902, Spencer (NSW); McArthur R., Borroloola, Apr 1970, Byrnes 1873 (DNA); Headwaters of Kilgour R., Apr 1970, Byrnes 1885 (DNA); Settlement Ck, Jan 1922, Brass 118 (CANB). QUEENSLAND: BURKE DISTRICT: 9 miles W of Westmoreland Stn, Jun 1968, Perry 1363 (CANB); 19° 00'S. 138° 45'E., Apr 1935, Blake 8678 (BRI); 10 miles S of Morestone Stn, Apr 1948, Perry 1056 (BRI); Bentinck I., Jun 1963, Tindale & Aitkin (AD); Gregory R., Jul 1928, MacGillivray (BRI). Cook DISTRICT: Georgetown, Aug 1913, Cambage (NSW) and Feb 1922, White 1369 (BRI); Gilbert R., Feb 1922, White 1367 (BRI); Chillagoe, Dec 1917, Michael (BRI) and Oct 1912, Dovan (NSW); Alma-den Feb 1922, White 1368 (BRI, NSW); Laura Rd, Jul 1965, Gittins 968 (NSW); 15° 50'S., 144° 35'E., Jul 1965, Gittins (BRI); 15° 50'E, 142° 15'E, Aug 1964, Blake 12584 (BRI, AD); McLeod R, Sep 1960, Volck (BRI). NORTH KENNEDY DISTRICT: Kidston, Aug 1919, Cowel (BRI).

Range: Northern Australia north of latitude 20° S.

Habitat: The species is restricted to the banks, levees or shores of permanent or seasonal creeks, rivers, lagoons or swamps or around sinkholes in limestone areas.

Observations and Notes: Bentham remarked on the wide variability of this species, in particular the shape and size of the fruit. This comment can be extended to most characters of the species and is further complicated by differences in the glabrescent nature of the indumentum. However the large leaves which are glabrescent above and the nearly cylindrical fruit with a distinct beak from 0.2 cm to more than 1 cm long enables determination to be made readily on most occasions.

In most favourable localities *T. platyphylla* will retain the last season's leaves for some time after the appearance of the new foliage, but generally the tree is leafless for a short period even though the fruit may be retained. Flowering commences in October and continues through the wet months. Mature fruits may be found from January to October. The species is known as "Durin" in Queensland.

Of the two collections made by and referred to by Mueller, the Victoria River specimen was selected as the lectotype as it has flowers. The Fitzmaurice River collection is sterile.

13. Terminalia petiolaris A. Cunn. ex Benth., Fl. Aust. 2:502 (1864); W.V. Fitzgerald, Proc. Roy. Soc. W.A. 3:184 (1918). Type: Point Cunningham Cygnet Bay, W. Australia, Feb 1822, Cunningham 320 (lectotype: K)

Shrub, rarely tree to 10 m high, deciduous. Trunk and branches with dark grey, longitudially fissured, rough bark. Branchlets at first appressed pubescent, glabrescent, sometimes sympodial. Leaves spirally arranged, not crowded; glands on petioles and near lamina margins; lamina chartaceous, broadly ovate or elliptical, acuminate to obtuse, cuneate at the base, 4-12 cm long, 2-6 cm wide, pubescent when young, glabrescent, shiny and often minutely verruculose above, few scattered hairs below; domatia small and not numerous; petioles slender, 2-5 cm long, glabrescent but usually retaining a few hairs at the base. Spike andromonoecious, minutely pubescent, interrupted, rarely exceeding the leaves; bracts narrowly triangular, ca 1.5 mm long, caducous. Flowers both male and perfect 6 mm diam., 6-8 mm long. Calyx glabrous or with a few scattered hairs both inside and outside, lobes acute, ca 2 x 2 mm. Stamens with glabrous filaments about 4 mm long. Disc villous. Style glabrous. Mature fruit glabrous, ellipsoid, 2-2.5 cm long, 1-1.5 cm diam., distinctly beaked at the apex, succulent, dark red to black, in cross section showing a well developed, broadly spindle shaped,

sclerenchymatous core surrounded by a ring of alveolar tissue, both together constituting ca 70 per cent of the diameter, all enclosed in a ring of succulent tissue, mucilage canals absent; slightly compressed to produce two obscure lateral angles, smaller and green when immature.

WESTERN AUSTRALIA: Point Cunningham, Cygnet Bay, W. Australia, Feb 1822, Cunningham 320 (2 sheets, isolectotype, K); Broome, Apr 1944, Gardner (PERTH), Aug 1965, Beauglehole 11250 (PERTH), and Apr 1905, Fitzgerald (PERTH, NSW); Cable Beach, Broome, May 1971, Byrnes 2233 (DNA); Roebuck Bay, Jul 1970, Carolin 7494 (DNA); Swan Point, Dec 1906, Fitzgerald 1710 (PERTH, NSW); Broome, Aug 1972, Lullfitz (BRI, DNA).

Range: Coastal areas of Western Australia in the vicinity of Broome.

Habitat: Coastal dunes on stabilised sand.

Observations and Notes: The thin leaves with their proportionately long petioles are distinctly different from those of other Australian species. It has been confused with *T. microcarpa* Done, from which it differs by having glabrous flowers, longer petioles and larger fruits.

The tree flowers in February and the fruit begins to mature in May and are usually retained by the tree for several months.

Of the three sheets of Cunningham's collection from Point Cunningham the sheet marked with the Kew negative No 8630-was chosen as the lectotype as it has the most developed inflorescence and matched the description.

In W.A. For. Dept. Bull. No 32:73 (1923) Gardner misapplied the name T. petiolaris to T. latipes.

14. Terminalia muelleri Benth., Fl. Aust. 2:500 (1864); F. Muell., Fragm. 9:160 (1875); F.M. Bail., Qd Fl. 567 (1900), Comp. Cat. Qd Pl. 180 (1913), Cat. Qd Woods, 64 (1899); Maiden, Usef. Nat. Pl. Aust. 606 (1899); Domin, Biblioth. Bot. 89:1000 (1928). Type: Edgecombe Bay, Dallachy (lectotype, K; isolectotype, MEL).

Myrobalanus muelleri O. Kuntze, Rev. Gen. Pl. I. 237 (1891) based on Terminalia muelleri Benth.

Terminalia muelleri var. minor Benth., Fl. Aust. 2:500 (1864). Type: New Holland, 1770, Banks & Solander (NSW, syn); Islands of Carpentaria, R. Brown (not seen).

Tree or shrub to 10 m high, deciduous. Trunk and branches with light grey fissured bark. Branchlets appressed pubescent at first, glabrescent, commonly sympodial. Leaves spirally arranged, crowded; glands present on the primary veins and commonly at the base of the lamina; lamina coriaceous, discolorous, obovate, obtuse or slightly retuse, rarely shortly acuminate, attenuate at the base, 5 - 16 cm long, 3-7.5 cm wide, thinly villous at first, glabrescent but retaining a few hairs along the midvein, minutely verruculose above; domatia common, usually visible without lens; margins commonly recurved; petioles 0.8-2.7 cm long, glabrescent. Spike andromonoecious, appressed pubescent, interrupted, as long as or shorter than the leaves; bracts linear, ca 1 mm long, caducous. Flowers 3-5 mm long, ca 6 mm diam. Calyx tube with appressed

pubescence; lobes acute, ca 2 x 2 mm, glabrous inside and outside, red discolouration common outside on older flowers. Stamens with glabrous filaments 3 mm long. Disc villous. Style glabrous. Mature fruit glabrous or with a few scattered weak hairs, ovoid or ellipsoid, 1.2-2 cm long, 0.8-1.5 cm diam., sometimes slightly compressed, without angles or ridges, with or without a very short beak, purple or black, succulent, in cross section showing a well developed irregularly shaped core of sclerenchymatous tissue surrounded by alveolar tissue to form an elliptical structure constituting ca 75 per cent of the diam., with small mucilage canals at the outer edge all being surrounded by a ring of succulent tissue; similar in shape or slightly more compressed, smaller and green when immature.

QUEENSLAND. COOK DISTRICT: Cape York, Oct 1848, MacGillivray (lectoparatype, K); Cooktown, Cowley 7 (BRI); Endeavour River, Persilo 17 (BRI) and Aug 1904, sent by Bailey (NSW); Murray I., Torres Strait, Apr 1971, Lawrie (BRI); Mapoon, Apr 1899, Ward (BRI) and 1901, J. Bailey (BRI); Howick Group, Aug 1955, Mueller (lectoparatype, MEL); Newcastle Bay, May 1948, Brass 18634 (CANB, BRI); Cape York Pen., Roth 237 (BRI); Batavia R., Aug 1904, sent by Bailey (NSW); Yarrabah, Jul 1918, Michael 430 (BRI); Machams Beach, Cairns, Jul 1946 Martin (BRI); 28 miles (rd) N of Cairns, Nov 1971, Byrnes 2417 (DNA) 18 miles (rd) N of Cairns, Nov 1971, Byrnes 2421 (DNA); Oak Beach, Sep 1969, Hyland 2414 (BRI); Brampston Beach, Oct 1968, Hyland 2121 (BRI); Flying Fish Pt, Nov 1971, Byrnes 2405 (DNA); Bloomfield Beach, Smith 11042 (BRI); Red Island Pt, Oct 1965, Smith 12568 (BRI); North Queensland, Cowley 88C (BRI); Kamerunga, Jan 1892, Cowley 60 (BRI); Pelican I., Jan 1949, Oxenford (NSW). NORTH KENNEDY DISTRICT: Mission Beach, Jul 1959, Jones 1261 (CANB), and Nov 1971, Byrnes 2403 & 2407 (DNA); Dunk I., in 1914, Banfield (BRI); Cardwell, Nov 1971 Byrnes 2425 & 2426 (DNA); Town Common, Townsville, Jan 1968, Henderson 323 (BRI); Nellie Bay, Magnetic I., Nov 1942, Snith T209 (BRI); Magnetic I., Mar 1935, Blake 8205 (BRI); Cape Upstart, Oct 1950, Blake 18627 (BRI); Bowen, Nov 1971, Byrnes 2430 (DNA); Hayman I. Jun 1934, White 10134 (BRI). SOUTH KENNEDY DISTRICT: Brampton I., Jul 1963, Scanlon 8c (BRI).

Range: Cape York Peninsula and the east coast of Queensland as far south as Rockhampton.

Habitat: Stabilised dunes along beaches.

Observations and Notes: Of the three specimens listed by Bentham the Dallachy specimen from Edgecombe Bay was selected as the lectotype as it matches the description of fruiting material which is of primary importance in determination of the species and the specimen is well preserved.

The confusion of this species with *T. melanocarpa* and *T. subacroptera* is discussed under those species. Indications are that the incomplete nature and paucity of the early collections contributed to this confusion and led to the following statements by Bentham "calyx tube as well as the limbs glabrous outside" and "growing to considerable height in the ranges". These statements were found to be inconsistent with later collecting and observations.

The variation in the species is continuous and does not allow the recognition of infraspecific taxa. For this reason *T. muelleri* var *minor* cannot be recognised.

The name *T. microcarpa* was applied to this species by Mueller (Fragm. 3:92 (1862)) in discussing the relatioships of *T. melanocarpa*.

A useful character found in fresh material of *T. muelleri* is the red colouration appearing on the older flowers, which to date, has not been observed in any other Australian species.

The small trees or shrubs flower in November — December with the growth of the new seasons leaves while still retaining some of the ripening fruit of the previous year. The succulent part of the fruit is commonly infected with fly larvae when ripe.

15. Terminalia subacroptera Domin, Biblioth. Bot. 98: 1000 (1928). Type: Mettal Mt., Chillagoe, Nov 1910, K. Domin 6949, (holotype, PR 529558).

Terminalia crassifolia Exell, J. Arn. Arb. 20: 319 (1939), Fl. Mal. 4: 569 (1954); Coode, Man. of the For. Trees of P. & N.G. 1: 40 (revised 1969). **Type:** Mabaduan, Western Division, Papua, Apr 1936, Brass 6478. (BM, holo; BRI, LAE, iso).

Terminalia insularis C.T. White, Proc. Roy. Soc. Qd, 55: 64 (1944); Exell, Fl. Mal. 4: 569 (1954). Types: Manoa Arboretum, Hawaii, (cultivated), 13 Oct 1940, E.L. Caum. (BRI, holo; K, iso).

Tree to 12 m high, deciduous. Trunk and branches with finely tessellated grey bark. Branchlets pubescent at first, glabrescent, commonly sympodial. Leaves spirally arranged, usually crowded; glands rare on primary veins, common at base of lamina or on petioles; lamina subcoriaceous or coriaceous, discolorous, obovate to broadly obovate, obtuse or retuse, rarely shortly acuminate, cuneate or shortly attenuate at the base, 5-10 (-17) cm long, 3-7 (-9) cm wide, pubescent on both sides when young, glabrescent but retaining some indumentum below at least on the veins, sometimes verruculose above, convex above with recurved margins; domatia rare; petioles pubescent; 1-2.6 cm long. Spike andromonoecious, pubescent, dense or interrupted, as long as or exceeding the leaves; bracts narrowly oboyate, 1.5-2 cm long, caducous. Flowers both male and perfect 3-5 mm long, 4-5 mm diam. Calvx tube pubescent, lobes deltoid, 2 x 2 mm, sparsely pubescent to glabrous outside, sparsley pilose inside. Stamens with glabrous filaments, 3-5 mm long. Disc and Style villous. Mature fruit ellipsoid or cylindrical, rarely slightly compressed, with or without short beak, 10-15 mm long, 5-9 mm diam., glabrescent, dark purple, succulent, in cross section showing a well developed broadly spindle shaped or elliptical core of sclerenchymatous tissue surrounded by a narrow ring of alveolar tissue, both together constituting 90 per cent of the diameter and surrounded by a ring of succulent tissue containing a number of irregularly distributed mucilage canals; green, compressed, with two lateral ridges and sometimes winged towards the apex when immature.

Northern Territory: Fletcher Ck, Apr 1970, Byrnes 1864 (DNA); Wearyan R., Apr 1970, Byrnes 1868 (DNA); Foelsche R., Jul 1948, Perry 1830 (BRI); Settlement Ck, Jan 1922, Brass 107 (BRI). Queens Land: Burke District: Massacre Inlet, Aug 1922, Brass 194 (CANB, BRI); Mornington I., May 1963, Tindale (AD); Bentinck I., May-Jun 1963, Tindale (AD); Karumba, Jul 1960, Trapnell 189 (BRI). Cook District: Thursday I., Aug 1904, sent by Bailey (NSW) and May 1962, Tracey & Webb (BRI); Lockerbie, Apr 1948, Brass 18436 (CANB, BRI) and Nov 1962, Hyland 2476A (BRI); Portland Roads, Nov 1965, Webb (BRI); Annan R. Crossing, Cooktown, Aug 1959, Smith 10624 (BRI); 48 miles SW of Cooktown, Aug 1959, Smith 10767 (BRI); SW of Cooktown, Aug 1962, Tracey & Webb (BRI); Mt Simon, Aug 1959, Smith 10694 (BRI); Rutland Plains, Whitehouse (BRI); Northcote, Jun 1929, Fordent (BRI); Coen, Aug 1948, Brass 19816 (CANB, BRI); Coen, Garroway 3 (BRI); Mt Carbine, Sep 1936, White 10630 (BRI); Stannary Hills in 1910, Bancroft (BRI); between Chillagoe & Mungana, Jan 1972, Hyland (DNA); 8 miles W of Dimbula, Jun 1955, Tracey & White (BRI). New Guinea Papua: Mabadaum, Western Division, Apr 1936, Brass 6527 (LAE); Mabadaum, Daru District, July 1968, Henty & Katik NGF 38625 (LAE).

Range: Eastern Arnhem Land in the Northern Territory to Cape York Peninsula of Queensland and south-western areas of Papua including the islands of Torres Strait and eastern Gulf of Carpentaria.

Habitat: Commonly on the banks and flood plains of rivers and creeks in the open sclerophyll forests but may occur in other localities in open monsoon forest.

Observations and Notes: This species exhibits a wide range of variation in the density and distribution of the indumentum. The type specimen demonstrates this variation very well, having some leaves with a very sparse pubescence below while other leaves have a reasonably dense pubescence. Domin described the immature fruit with a narrow wing and this, with the variation within the species was the probable cause of the species not being recognised from its description, resulting in the later publications of new names for the species.

Exell described the more glabrescent form from Papua while C.T. White based his description on specimens obtained from a tree grown under very wet conditions in Hawaii from seed collected on Thursday Island. The Hawaian specimens have larger and more pubescent leaves than other specimens collected from trees growing on Thursday Island but match in other details.

This species has close affinites with *T. muelleri* which it resembles in most characters but can be readily separated on the presence of indumentum and the generally smaller fruit with distinct ridges when young. This close similarity has been commented on by A.W. Exell (1939) and L.S. Smith (personal communication) but the species can be separated on adequate herbarium material.

16 Terminalia arenicola N. Byrnes, sp. nov. Type: North Kennedy District: Townsville 3 Dec 1971, N. Byrnes 2442, (holotype, CANB 226580; isotypes, DNA, NT, BRI, L, K, NSW, LAE).

Arbor decidua ad 10 m alta. **Truncus et ramus** cortice atroschistaceo tessellato. **Folia** spiraliter disposita conferta; lamina coriacea discolora late obovata apice plerumque breviter acuminata et basi angustata vel breve truncata 9-22 cm longa 5-13.5 cm lata primo tenuiter pilosa glabrescens domatiis et glande supra minutus verrucosa: petiolus 0.5-1.5 cm longus appresso pubescenti. **Spica** andromonoecia interrupta foliis breviora vel aequantes prope basi floribus perfectis. **Bracteae** auguste deltoideae ca 1 mm longae caducae. **Flos** 5-7 mm longus 6-7 mm diam. lobis calycis glabris vel tenuiter pilosis triangularibus ca 2.5 x 2 mm que tubo calycis appresso pubescenti vel tenuiter piloso. **Filamentum** staminis glabrum ca 2 mm longum. **Discus** villosus. **Stylus** glabrus. **Fructus** glaber ovoideus leviter compressus plerumque angulis duobus lateralibus breve rostellatus 2.5-4 cm longus 1.7-2.5 cm latus 1.4-1.8 cm crassus ater vel purpureus et succulentus ubi maturus vel compressus porcis duobus distinctis lateralibus et atrovirens ubi immaturus.

Tree to 10 m high, deciduous. **Trunk and branches** with tessellated grey bark **Branchlets** appressed pubescent, commonly sympodial. **Leaves** spirally arranged, crowded; glands on the primary veins and at the base of the lamina; lamina coriaceous, discolorous, broadly obovate, usually very shortly acuminate, attenuate or shortly truncate at the base, 9-22 cm long, 5-13.5 cm wide, thinly pilose at first, glabrescent but retaining indumentum along veins below, minutely verruculose above; domatia present; petioles appressed pubescent, 0.5-1.5 cm long. **Spike** andromonoecious with perfect flowers near the base, appressed pubescent, interrupted, as long as or shorter than the leaves; bracts narrowly triangular, *ca* 1 mm long, caducous. **Flowers** both male

and perfect 6-7 mm diam., 5-7 mm long. Calyx tube appressed pubescent to thinly pilose; lobes triangular, ca 2.5 x 2 mm, glabrous or thinly pilose. Stamens with glabrous filaments ca 2 mm long. Disc villous. Style glabrous. Mature fruit glabrous, ovoid, 2.5-4 cm long, 1.7-2.5 cm wide, 1.4-1.8 cm thick, with a short beak, slightly compressed, sometimes with lateral angles, succulent, dark red or black, in cross section showing a well developed irregularly shaped sclerenchymatous core including some alveolar tissue and surrounded by a zone of corky parenchyma containing alveolar tissue, all together constituting ca 80 per cent of the diameter and surrounded by a ring of succulent tissue, mucilage canals absent; distinctly compressed and laterally ridged, green to red and smaller when immature.

QUEENSLAND. COOK DISTRICT: Cape Tribulation, Jun 1943, Flecker (NSW); Low I., May 1963, Cribb (BRI); Cairns, Altena 465 (BRI); Green I. near Cairns, Feb 1963, Wyatt (BRI), and Oct 1932, Wright (BRI); 55 miles N of Cairns, Sep 1970, Hind 58 (NSW); Newell Beach, Nov 1971, Byrnes 2423 (DNA); Snapper I., June 1819, Cunningham 181 (K). NORTH KENNEDY DISTRICT: Clump Pt, Mission Beach, Nov 1951, Smith 4828a (BRI); Mission Beach, Jul 1959, Jones 1216 (BRI), Apr 1965, Altena (BRI), Nov 1971, Byrnes 2401 (DNA), and Nov 1971, Byrnes 2404 (DNA), Palm I., Bancroft 61 (BRI); Brammo Bay, Dunk I., May 1971, Banfield (NSW); Cardwell, Nov 1971, Byrnes 2424 & 2427 (DNA); Botanic Gardens, Townsville, Feb 1927, White 3410 (BRI); Townsville, Mar 1922, White 1621 (BRI, NSW); Townsville Beach, Jan 1970, Byrnes 1731 (DNA); Etty Bay, Dec 1941, White 11699 (BRI), and Mar 1967, Winkel (BRI); Bowen, Nov 1971, Byrnes.

Habitat: Stabilised sand along beachfronts, commonly growing with *T. catappa* and *T. muelleri*. It will grow under cultivation in many different situations.

Range: The east coast and off shore islands of Queensland north of latitude 22° S being more common in the north.

Observations and Notes: This species has been confused with and incorporated under *T. melanocarpa* (see notes under that species). The species is closely allied to *T. catappa* with its similarly shaped but generally smaller leaves and structurally similar but smaller and darker coloured fruit.

The tree flowers mainly during the wet season and fruit at various stages of development can be found at most times. The tree is leafless for a short period usually during September.

In Queensland this species is commonly used as a specimen or street tree. It has a marked 'pagoda' shape when young, is able to maintain good shape in exposed situations near the sea and is preferable to *T. catappa* if a smaller and more compact tree is required.

Terminalia catappa L., Syst. Nat. ed. 12, 2:674 (1767); F. Muell., Fragm.
 9:160 (1875); F.M. Bail, Qd Fl. 566 (1900), Comp. Cat. Qd Pl. 180 (1913); Audas, Native Trees of Aust. 277 (1934); Exell, Fl. Mal. 4:566 (1954); Coode, Man. For. Trees Papua and N.G. pt. I (rev.):33 (1969); K. Schum. in K. Schum. & Hollr., Fl. Kais. Wilh. Land 83 (1889); Back., Fl. Java. 1.377 (1963); A.C. Smith, Brittonia, 23:405 (1971).

The above were selected from the numerous references to this widespread species on the basis of their importance to the Australian area.

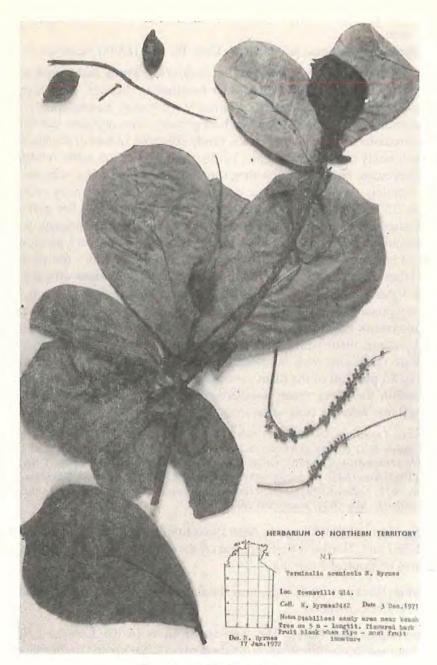


Figure 3. Terminalia arenicola Holotype

Type: L1221.1 (LINN, holo)

Terminalia moluccana Lamk., Encycl. 1:349 (1783). Type not seen.

Myrobalanus catappa Kuntze Rev. Gen. Pl. 237 (1891) based on T. catappa.

Tree seldom above 15 m in Australia, deciduous. Trunk and branches with grey finely tessellated bark, usually with deeper longitudinal fissures. Branchlets thick, at first densely tomentose, glabrescent, commonly sympodial. Leaves spirally arranged, usually crowded; glands present near ends of primary veins and near subcordate base; lamina coriaceous, discolorous, obovate, rarely elliptical, obtuse or shortly acuminate, subcordate, rarely truncate at the base, 12-36 cm long, 6-15 cm wide, velutinous when young, glabrescent but usually retaining some indumentum on the veins on the lower surface, minutely verruculose above, domatia common along primary veins; petioles thick, 0.4-2.5 cm long, pubescent. Spike andromonoecious, with few perfect flowers near the base, shorter than the leaves, interrupted, appressed pubescent or glabrous; bracts acuminate, less than 1 mm long, caducous. Flowers male ca 5 mm long, perfect ones 10-13 mm long, both ca 6 mm diam. Callyx glabrous or with a few scattered hairs outside; lobes deltoid, ca 1.5 x 1.5 mm, glabrous inside. Stamens with glabrous filaments ca 3 mm long, Disc villous. Style glabrous. Mature fruit glabrous, ellipsoid, slightly compressed, 5-8 cm long, 2.5-5 cm wide, commonly angled, rarely beaked, yellow, sometimes tinted red, succulent, in cross section showing an irregular core of sclerenchymatous tissue with radiating arms within a broadly spindle-shaped area of corky tissue containing well developed alveolar tissue towards the core and constituting ca 85 per cent of the diam., surrounded by succulent tissue, mucilage canals present within the corky tissue; smaller, green, markedly compressed with distinct wings confluent with the beak when immature.

NORTHERN TERRITORY: Darwin (cult.), Nov 1970, Byrnes 2022 (DNA); 10 miles S of Cape Arnhem, Jun 1972, Byrnes 2671 (DNA); QUEENSLAND: COOK DISTRICT: Goode I., Torres Strait, Jun 1897, Bailey (BRI, NSW); Dalrymple I., Dec 1892, Cowley (BRI); Wonga Beach, Nov 1971, Byrnes (DNA); Edge Hill, Cairns, Jul 1965, Avier (BRI); Cairns, Sep 1959, Jones 1340 (CANB); Gordonvale, Illingworth (BRI); Johnson R., Nov 1917, Ladbrook (BRI). North Kennedy District: Mission Beach, Nov 1971, Byrnes 2402 (DNA); Townsville, Mar 1933, White 8963 (BRI).

Range: Natural distribution in Australia is from Bowen, Queensland to north eastern Arnhem Land, Northern Territory and on the off shore islands. It is cultivated over a wide area of tropical Australia.

Habitat: Rocky or sandy areas near the shoreline but will grow in a wide range of situations under cultivation.

Observations and Notes: The type specimen is in the Linnean collection in London but there is no indication on the sheet of collector's name or the place of origin of the specimen. In Index Nominum Genericorum this species is listed as the type for the genus.

The species is widely recorded in the literature and on some occasions it has been named incorrectly. Attempts have been made to establish infra-specific taxa. These points have been discussed by Exell and others and as they have not been raised in Australian literature further discussion in this paper is unnecessary.

The large yellow mature fruit distinguishes this species from all Australian species. Vegetatively it is similar to *T. arenicola* but the leaves are generally larger and have domatia along the primary veins.

The species is common throughout the tropical areas commonly being planted as a specimen tree because of its attractive 'pagoda' shape when young or for its edible fruit. As noted by Corner and Exell the trees lose their leaves twice annually; the leaves becoming highly coloured prior to falling. Flowering begins early in the 'wet' season and mature fruit are common from February to May in Australia. The wide distribution of the species as a cultivated plant has led to numerous names including 'Indian Almond' used in Australia.

18. Terminalia carpentariae C.T. White, Proc. Roy. Soc. Qd. 11:57 (1950); Specht & Mountford, Am. - Aust. Sc. Exp. to Arnhem Land 3:265 (1958). **Type:** Arnhem Land, (Crocodile Is.), *Dr. Donald Thompson* 111, (HOLO, BRI 1137). Only one specimen of the type material is known.

Shrub or Tree to 15 m high, deciduous. Trunk and branches with smooth to rough, finely fissured grey bark, not deeply grooved, decorticating in irregular areas. Branchlets densely velutinous. Leaves spira! 'v arranged, crowded; glands conspicuous on petioles, often obscured by indumentum on lamina; lamina coriaceous, concolorous, broadly elliptical to almost circular, rarely ovate, obtuse to retuse, rarely shortly acuminate, shortly attenuate or truncate at the base, 5-12 cm long, 3.5-9.5 cm wide, both sides densely pubescent or rarely glabrescent; domatia present but usually obscured by the indumentum; petioles pubescent, 2-4.5 cm long. Spike andromonoecious, pubescent, dense, shorter than the leaves; bracts linearly triangular, less than 2 mm long, caducous. Flowers both male and perfect 3-4 mm diam., 3-5 mm long. Calyx velutinuous outside; lobes broadly triangular 1.5 x 1 mm, glabrous or with a few silky hairs near the base inside. Stamens with glabrous filaments, 2-3 mm long. Disc villous. Style glabrous. Mature fruit densely velutinous, ovoid, 1.5-3.5 cm long, 1.2-1.7 cm diam., succulent, with or without obscure angles and short beak, yellow-green, in cross section showing a broad spindle-shaped core of sclerenchymatous tissue constituting less than 50 per cent of the diameter with mucilage canals irregularly distributed around the outer edge, all being surrounded by a broad ring of succulent tissue, alveolar tissue absent; compressed, prominently laterally ridged and beaked when immature.

WESTERN AUSTRALIA: Deception Ra., Oct 1970, Bymes 2413 & 2414 (DNA), Northern Territory: Hodgson R. Downs, May 1969, Bymes 1607 (DNA); Katherine Gorge National Park, May 1969, Bymes 1636 (DNA), Nov 1968, Bymes 1181 (DNA), Jan 1967, Bymes 80 (DNA), and Jul 1970, Bymes 1933 (DNA); Maude Creek Goldfields, Jan 1965, Wilson 181 (CANB); 14° 10'S. 132° 12'E., Oct 1946, Blake 17276 (BRI); Plum Tree Creek, Apr 1969, Bymes 1509 (DNA); 116 miles, 110° Darwin, Story 7704 (CANB); 7 miles N of Mudginberry Hsd, Jun 1969, Bymes 1604 A & B (DNA); ca 10 miles N of Mudginberry Hsd, Jul 1970, Bymes 1949 (DNA); N bank East Alligator R., Sep 1968, Bymes 912 (DNA); Oenpelli, Oct 1948, Specht 1282 (CANB, BRI, AD); Yirrkala, Aug 1948, Specht 944 (CANB, BRI, AD); Groote Eylandt, Apr 1948, Specht 274 (CANB, BRI, AD); Groote, Jan 1922, Tindale (NSW); Bickerton I., Jun 1948, Specht 633 (CANB, BRI, AD); Settlement Creek, Oct 1922, Brass 236 (CANB, BRI). Queens-Land: Burke District: Lawn Hill, May 1940, Jensen 94 (BR1); 4 miles SE of Doomadgee Mission, June 1948, Perry 1386 (BRI); Mornington I., Jun 1901, Bailey (BR1, NSW), and May 1911, Bick (BR1).

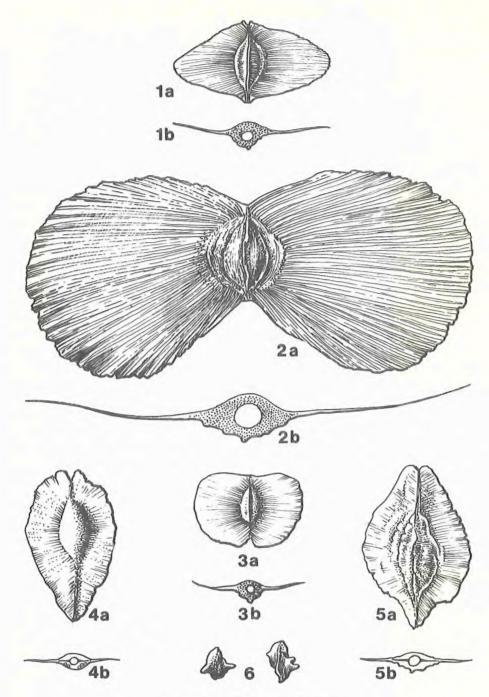


Figure 4. Fruits of *Terminalia* species a exteral view b transverse section

- 1 T. volucris, 2 T. platyptera, 3 T. oblongata, 4 T. canescens, 5 T. pterocarya, 6 T. bursarina

Range: Northern Australia between the Ord River system in Western Australia and the Flinders River in Queensland usually within 300 km of the coast.

Habitat: Mainly confined to sandstone or sandy alluvial plains but can occur on other soils of a stony, well drained or skeletal nature.

Observations and Notes: The pubescent fruit, densely pubescent leaves which have a silvery appearance when young and the decorticating bark which often sheds in large areas after bush fires enables relatively easy determination in the field. Some trees hold their leaves late into the dry season and may become glabrescent but hairs are retained along the midvein thus distinguishing it from T. latipes. (Also see discussion under T. ferdinandiana).

The trees generally lose their leaves in early September but usually retain their fruits which ripen when the tree is leafless or with the growth of the new foliage in October. Flowering usually occurs between October and December. The fruit is eaten by Aborigines, but is acid to taste, and the inner bark has been reported to be used for caulking canoes.

19. Terminalia latipes Benth., Fl. Aust., 2:501 (1864). **Type:** Victoria River, N.W. Coast of Australia, *Bynoe* (K, holo). Only one specimen of this collection is known.

Terminalia biangulata W.V. Fitzgerald, J. Proc. Roy. Soc. W.A., 3:184 (1918). Type: Woolybutt Creek, May 1905, Fitzgerald 982, (NSW 104121, PERTH).

Terminalia chlorocarpa W.V. Fitzgerald, J. Proc. Roy. Soc. W.A. 3:183 (1918). Type: Dillon Springs, Oct 1906, Fitzgerald 1657, (NSW 104122, PERTH).

Shrub or tree to 10 m high, deciduous. Trunk and branches with grey, smooth or finely fissured, tessellated or rugose bark decorticating often over small areas to reveal the smooth, yellow or orange inner bark. Branchlets thick, glabrous or with a few scattered hairs. Leaves spirally arranged, usually crowded on short thick branchlets; glands on petioles and primary veins; lamina coriaceous, discolorous, broadly obovate to broadly elliptical, obtuse to retuse, shortly attenuate or truncate at the base, 9-25 cm long, 7-16 cm wide, glabrous sometimes slightly glaucous; domatia visible with lens; petioles 1.5-5 cm long. Spike andromonoecious, pubescent, interrupted, usually longer than the leaves; bracts linearly triangular to spathulate, 1.5-3 mm long, caducous. Flowers both male and perfect 4-5 mm diam., 3-7 mm long. Calyx densely pubescent outside; lobes triangular to widely triangular, ca 1.5 x 1.5 mm, glabrous or with a few scattered hairs inside. Stamens with glabrous filaments, 2-3 mm long. Disc villous. Style glabrous. Mature fruit densely pubescent, ovoid, 1.8-3.5 cm long, 1-2 cm diam., occasionally obscurely angled, with or without a short obtuse beak, succulent yellow — green, in cross section showing a broad spindle shaped core of sclerenchymatous tissue constituting less than 40 per cent of the diameter with mucilage canals irregularly distributed around the outer edge, all being surrounded by a broad ring of succulent tissue; prominently laterally ridged and beaked when immature.

WESTERN AUSTRALIA: Pender Bay, Oct 1919, Lane-Poole 488 (PERTH); near Broome, Sep 1959, Lazarides 6549 (CANB, PERTH); Packhorse Ra., Jun 1905, Fitzgerald (NSW); Goose Hill, Sep 1906, Fitzgerald (NSW); Oomaloo Falls, May 1967, Byrnes 325 (DNA); 32 miles NNE of Denham River Stn, Jul 1949, Perry 2542 (BRI); Kurrungi, Oct 1952, Rust 36K (CANB, PERTH); Cambridge Gulf, Sep 1906, Fitzgerald (NSW); 40 miles W of Kununurra, Sep 1969, Byrnes 1712 & 1713 (DNA); 10 miles W of Kununurra, Sep 1969, Byrnes 1711 (DNA); Buttons Gap, Jun 1944, Gardner 7421 (PERTH), and Jul 1944, Durack (PERTH); Kimberley Research Stn, Feb 1950, Drysdale 195 (CANB), and Mar 1952, Langfield 269 (CANB, PERTH). NORTHERN TERRITORY: 42 miles SE of Kimberley Research Stn, Jul 1952, Perry 2948 (CANB, PERTH); Milligans Lagoon, Jul 1937, Stokes 19 (PERTH); 40 miles SE of Timber Creek, Jun 1952, Perry 2877 (CANB, BRI, NSW, PERTH); Jasper Gorge, May 1969, Byrnes 1569 (DNA), and Sep 1964, Robinson R871 (DNA); Victoria R. near bridge, Sep 1969, Byrnes 1703 (DNA); Lower Victoria R., Aug 1913, Winters (NSW); Victoria R., Apr 1969, Byrnes 1561 (DNA); 4 miles NW of Tipperary Hsd, Oct 1962, Muspratt SS0384 (DNA); Reynolds R., May 1969, Byrnes 1632 (DNA), Apr 1969, Cowley (DNA), Feb 1970 Byrnes 1743 (DNA), and Oct 1970, Byrnes 2018 (DNA); 23 miles SE of Stapleton Stn, Aug 1961, Lazarides 6635 (CANB, BRI); Cato R., Mar 1969, Harbison (DNA); Urquhart I., Sir Edward Pellew Gp, Dec 1962, Lavery (BRI).

Range: Kimberley District of Western Australia and the northern Victoria River and Arnhem Land areas of the Northern Territory.

Habitat: Stony, skeletal and sandy soils preferring hilly country and often growing in crevices in sandstone.

Observations and Notes: The description by Bentham included the misleading phrase "abruptly narrowed into a very short petiole" in the description of the leaf which subsequently caused some confusion. The petioles on the leaves of the type specimen measure from 1.5-2.2 cm long. These cannot be interpreted as short for the genus which has a number of species which petioles less than 0.5 cm long. In addition Fitzgerald was unaware of the changes which occur in both foliage and fruit as the season progresses and this resulted in him giving the taxon two further names. The type of *T. biangulata* has immature fruit and mature leaves as is common for the species in May when the type specimen was collected. The type of *T. chlorocarpa* was collected in October and has mature fruit and young leaves. As Bentham's name has precedence, both of Fitzgerald's names are combined under *T. latipes*.

The name *T. petiolaris* was erroneously recorded by Gardner in reference to a specimen collected by Lane-Poole on 16 Oct 1919 in Forestry Dept. Bull. No. 32:73 (1923).

This species loses its leaves in the late dry season but often retains the fruit into the new growing period. New leaves and flowers appear during October or November with or without the advent of rain. For discussion of the affinities see under *T. ferdinandiana*.

T. chlorocarpa H. Perrier, Ann. Mus. Col. 7:1:34 (1953), used for a species from Madagascar is illegitimate because it is a later homonym of T. chlorocarpa W.V. Fitzgerald published in 1918.

Terminalia ferdinandiana Exell, J. Bot. 73: 263 (1935); Specht & Mountford, Am. - Aust. Sc. Exp. to Arnhem Land 3: 265 (1958); S.T. Blake, Aust. J. Bot. 2: 107 (1954), based on *Terminalia edulis* nom. illeg. F. Muell., Fragm. 2: 151 (1861) non Blanco, Fl. Filip. ed 2: 265 (1845); Benth., Fl. Aust. 2: 501 (1864); Ewart & Davies, Fl. N. Terr. 212 (1917). Type: Arnhem Land, F. M(ueller) (K, holo).

Shrub, rarely tree to 8 m high, deciduous. Trunk and branches with finely fissured tessellated bark often having deeper longitudinal furrows or decorticating in irregular patches, Branchlets thick, glabrous or with a few scattered hairs, sometimes sympodial. Leaves spirally arranged, crowded; glands on petioles and primary veins; lamina coriaceous, concolorous, broadly elliptical to circular, obtuse, shortly attenuate or truncate at the base, (4-) 5-25 (-32.5) cm long, 5-29 (-23.5) cm wide, glabrous or with a few scattered hairs; domatia present along the mid-vein and often a few along the primary veins; petioles glabrous, (1.5-)2-10 cm long. Spike andromonoecious, glabrous or with a few scattered hairs, interrupted, as long as or longer than the leaves; bracts linearly triangular ca 1 mm long, caducous, Flowers ca 5 mm diam., male 4-6 mm long, perfect ones 6-8 mm long. Calvx glabrous inside and outside or with a few scattered hairs outside; lobes deltoid, ca 2 x 2 mm. Stamens with glabrous filaments 3 mm long. Disc villous. Style glabrous. Mature fruit glabrous, ovoid, shortly or obscurely beaked, 1.5-2.5 cm long, 1-1.8 cm diam., succulent, yellow-green, rarely partly red, showing in cross section a broadly elliptical sclerenchymatous core constituting 30-50 per cent of the diameter, surrounded by succulent tissue consisting of radiating mucilagenous cells with a number of mucilage canals near the core, alveolar tissue absent; prominently laterally ridged and beaked when immature.

WESTERN AUSTRALIA: Roebuck Bay, Jan 1890, Tepper 194 (PERTH); 27 miles N of Napier Range, May 1971, Byrnes 2250 (DNA); Camden Sound, Gardner (PERTH); Marie Springs, Prince Regent, Jul 1950, Gardner 9615 (PERTH). Northern Territory: Victoria R., Nov 1855, Mueller (MEL); Claravale Stn, May 1964, Robinson R466 (DNA); Douglas R. and Middle Ck, Jul 1946, Blake 16626 (CANB, BRI); Tipperary Hsd, Aug 1961, Lazarides 6701 (CANB); Flora R., May 1952, Perry 2825 (CANB, BRI, NSW); Ooloo Rd, 15 miles from Stuart Hgy, Jun 1964, Robinson R 593 (DNA); Brocks Ck, Jun 1946, Blake 16219 (CANB, BRI); Delissaville, Mar 1948, Specht 86 (BRI); Darwin, Feb 1914, Hill (BRI); Darwin, Nov 1933, Allen (NSW); Darwin, Feb 1927, Shiress & Bleeser (NSW); Port Darwin, Holtze 27 (MEL); Darwin, in 1891; Holtze 1214 (MEL); Darwin, Mar 1969, Byrnes 1481 (DNA); 14 miles S of Darwin, Feb 1970, Byrnes 1742 (DNA); Mt Bundy, Oct 1968, Byrnes 939 (DNA); and Apr 1969, Byrnes 1418 (DNA); Mary R., Jun 1955, White MR32 (CANB); 130 miles S of Darwin on Stuart Hgy, Mar 1969 Byrnes 1407 (DNA); 22 miles NE of Pine Creek, Apr 1969, Bymes 1534 (DNA); 20 miles N of Pine Creek, Apr 1956, Burbidge 5228 (CANB); 34 miles W of Pine Creek, Mar 1963, Lazarides 6856 (CANB, DNA); Edith R. Siding, Jan 1965, Wilson 223 (CANB); 12 miles NE of Katherine, Jan 1965. Wilson 89 (CANB, BRI, NSW); Plumb Tree Ck, Apr 1969, Bymes 1508 (DNA); Oenpelli, Oct 1948, Specht 1254 (CANB, BRI, NSW, AD, PERTH).

Range: Northern Territory north of latitude 16° S. and in the Kimberley region of Western Australia from Broome to Drysdale R. favouring the coastal area.

Habitat: It occurs as an understorey in mixed *Eucalyptus* forests on a wide variety of soils but may also occur as isolated shrubs or in pure stands on rocky or sandy sites.

Observations and Notes: Indications are that the Arnhem Land specimen named *Terminalia edulis* was the only specimen collected by Mueller or at least the only remaining specimen of the collection so it is regarded as the holotype. The use of the locality designation "Fitzmaurice R. Victoria R.S. Alligator R." to describe the area around the confluence of Alligator Creek and Fitzmaurice River in the Victoria River district in his descriptions and the labelling of the specimens as coming from Arnhem Land applies to a number of Mueller's specimens. Exell changed the species name to *T. ferdinandiana* because Blanco's use of the name *T. edulis* has priority but based the new name on Mueller's type.

The specimen collected by Mueller from the Victoria River and originally named *T. volucris* cannot be confused with the type material.

Gardner, W.A. For. Dept. Bull. No. 33:72 (1923), used the name T. melanocarpa incorrectly for this species and this error was common on herbarium sheets due partly to the fact that the fruit of the species commonly turns black when dried.

The species has close affinities with *T. latipes, T. carpentariae* and *T. hadleyana* and the main differences between these species are set out in the following table.

FRUIT GLABROUS T. ferdinandiana T. hadleyana T. carpentariae

LEAVES

In addition the fruit of *T. supranitifolia* is similar although smaller but the leaves are different.

T. ferdinandiana loses its leaves during July — August, flowers with the new growth during the early wet season and the fruit matures from April to June. The species is often found flowering out of season due to fire or unseasonal weather conditions. The fruit is edible but acid and is known locally as "Billy Goat Plum".

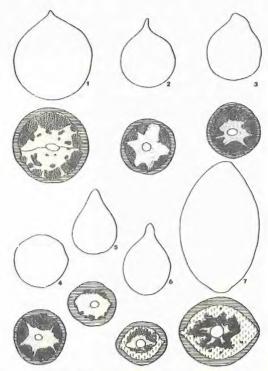
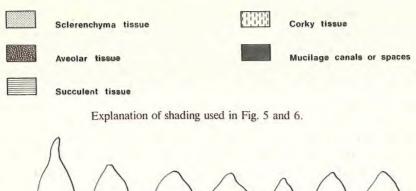


Figure 5. Mature Fruits of *Terminalia* species Longitudinal outline and median cross section

1. T. cunninghamii, 2. T. grandiflora, 3. T. fitzgeraldii,

4. T. arostrata, 5. T. savannicola, 6. T. arenicola, 7. T. catappa.



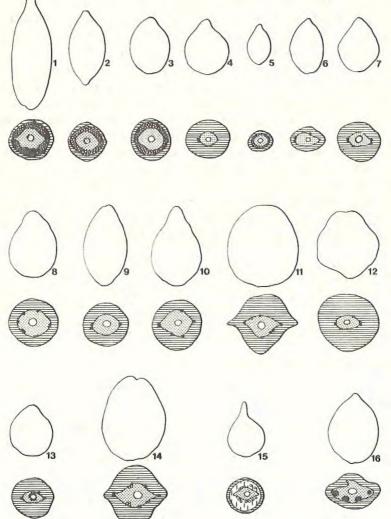


Figure 6. Mature Fruits of *Terminalia* species Longitudinal outlines and median cross sections

- 1. T. platyphylla, 2. T. petiolaris, 3. T. muelleri, 4. T. supranitifolia, 5. T. subacroptera,
- 6. T. sericocarpa, 7. T. hadleyana, 8. T. ferdinandiana, 9. T. carpentariae,
- 10. T. latipes, 11. T. chillagoensis, 12. T. aridicola, 13. T. porphyrocarpa,
- 14. T. melanocarpa, 15. T. erythrocarpa, 16. T. complanata.

21. Terminalia hadleyana W.V. Fitzgerald, J. Proc. Roy. Soc. W.A. 3: 183 (1918). Type: Sunday Island (Shark Bay), W.V. Fitzgerald, Nov 1906 (lectotype, NSW 104115; isolectotype, PERTH).

Tree to 7 m high, deciduous, Trunk and Branches with yellow to grey, smooth or finely fissured rough bark, decorticating in small or large areas. Young branchlets hoary pubescent. Leaves spirally arranged, sometimes crowded at the ends of short branchlets; glands present on petioles and primary veins but usually obscured by the indumentum; lamina coriaceous, discolorous, (venation darker on the upper surface), ovate to broadly elliptical or almost circular, obtuse to very obtuse or sometimes retuse, truncate, shortly attenuated or rarely shortly decurrent at the base, (4-)6-12 cm long, (3-)5-9 cm wide, velutinous, sometimes at length glabrescent; domatia present but obscured by the indumentum; petioles pubescent, (1.5-)2-4 cm long. Spike andromonoecious, pubescent when young, glabrescent, interrupted, as long as or longer than the leaves; bracts linearly triangular or oblong, up to 2 mm long, caducous. Flowers both male and perfect 4-5 mm long, ca 5 mm diam. Calyx glabrous outside; lobes deltoid, 1.5 x 1.5 mm, glabrous or with a few scattered hairs inside. Stamens with glabrous filaments, 2-3 mm long. Disc villous. Style glabrous. Mature fruit glabrous ovoid, 1.5-2.5 cm long, 0.8-1.5 cm diam., with short often curved beak, yellow green, succulent, without angles or ridges, in cross section showing a small broadly spindle shaped or nearly circular core of sclerenchymatous tissue constituting less than 30 per cent of the diameter and surrounded by a broad ring of succulent tissue with a number of mucilage canals near the sclerenchymatous core, alveolar tissue absent; smaller and prominently laterally ridged when immature.

WESTERN AUSTRALIA: Boulder Hill, 14 miles ENE of Oobagooma Stn, Oct 1959, Lazarides 6608 (CANB, BRI, NSW, PERTH); Napier R., May 1971, Byrnes 2246 (DNA); 27 miles NE of Napier Downs Stn, Jul 1959, Lazarides 6461 (CANB, PERTH); near Inglis Gap, May 1905, Fitzgerald 754 (PERTH); Bold Bluff, May 1971, Byrnes 2261 (DNA); Glenelg R. Jun 1921, Gardner 1384 (PERTH); Prince Regent R., in 1891, Bradshaw & Allen (NSW); Gibb R., May 1971, Byrnes 2271 (DNA) King Edward R., Aug 1921, Gardner 1502 (PERTH) Kalumburu, May 1971, Byrnes 2299 (DNA).

Range: Kimberley area of Western Australia.

Habitat: Common on stony outcrops and steep sloping country but sometimes found on flat areas near hills.

Observations and Notes: Fitzgerald forwarded his specimens to Maiden in Sydney for examination and reference as Maiden was arranging the publication of Fitzgerald's paper. For this reason it is believed that the specimen in Sydney was that used for the description and so is nominated as the lectotype

The name *Terminalia discolor* was incorrectly applied to this species by both Fitzgerald, J. Proc. Roy. Soc. W.A. 3:182 (1918) and Gardner, W.A. Forest Dept. Bull. 32:72 (1923), and this name occurred on some of the specimens. The glabrescent nature of the leaves was probably the principal cause of errors in determination coupled with the lack of knowledge of species from the area due to the lack of collection of adequate material.

The affinities of this species are discussed under *T. ferdinandiana*. Fruit specimens are often poor due to parasitic insects infecting both the succulent tissue and the

sclerenchymatous core. The infection causes the mature fruit to be irregular in shape and sometimes causes immature fruit to be much curved.

Fitzgerald described the trees as evergreen but Lazarides and other observers have indicated that the species is deciduous. The trees apparently lose their leaves for a short period about September. Flowering commences during October or November with the early fruit maturing in the monsoon season. From observations made in 1971 it was found that fruit from the trees in the south of the species distribution had matured and fallen whilst immature fruits were still present on trees in the northern areas in June.

22. Terminalia supranitifolia N. Byrnes, nom. nov. based on *Terminalia discolor* F. Muell., Fragm. 3:92 (1862) non Spreng., Neve Entdeck 2:111 (1820); Benth. Fl. Aust. 2:501 (1864). Type: Hierson (Hearson) I., Nicol Bay, North Western Australia, F. Gregory Expedition (MEL 1005526, holo; K, iso).

Shrub to 3 m high, spreading, deciduous. Trunk and branches with dark grey, irregularly fissured rough bark. Leaves spirally arranged, sometimes crowded; glands near the base of lamina; lamina subcoriaceous, discolorous, ovate to obovate, obtuse to shortly acuminate, attenuated and variously decurrent at the base, 3.5-7.5 cm long, 2.5-4.5 cm wide, at first appressed pubescent, glabrescent, shiny above, dull below; domatia absent; petioles appressed pubescent, 1-1.5 cm long. Spike andromonoecious, pubescent, dense, as long as the leaves; bracts ovate, ca 1 mm long, caducous, Flowers both male and perfect 3-4 mm diam., 4-7 mm long. Calyx tube appressed pubescent; lobes glabrous inside and outside, acuminate or acute, 1 x 1.5 mm. Stamens with glabrous filaments ca 3 mm long. Disc villous. Style glabrous. Mature fruit glabrous, ovoid or globular, with or without a short thick beak, 1-1.5 cm diam., 1-2 cm long, succulent, colour not known, in cross section showing a well developed spindle shaped, sclerenchymatous core constituting ca 30 per cent of the diam., with mucilage canals irregularly distributed around the outer edge, all being surrounded by a broad ring of succulent tissue, alveolar tissue absent; compressed, prominently laterally ridged or narrowly winged and shortly beaked when immature.

WESTERN AJSTRALIA: Hierson Cove Rd., 2 miles from Dampier, Nov 1971, Lullfitz (3 collections) (DNA).

Range: Near Nickol Bay, Western Australia. The true limits of the range of this species are unknown but it is believed to be limited as indicated by the collections.

Habitat: Near rocky ridges in low hilly country not too distant from the coast.

Observations and Notes: The name used by Mueller, i.e. *Terminalia discolor*, is illegitimate as it is a later homonym of *T. discolor* Spreng., Neve Entdeck 2:111 (1820) for a species from Brazil.

The locality of the collections of the type material now spelled Nickol Bay has a few small islands within it and a large number to the west of it. To date no information has been found indicating which of these islands was referred to as Hierson I. by Gregory. Until November 1971, only one collection, the type was known of this species and this collection to quote Bentham "much too imperfect for satisfactory diagnosis". The

paucity of the collection led to considerable confusion particularly with *T. hadleyana*. Both Fitzgerald, J. Proc. Roy. Soc. W.A. 3:182 (1918), and Gardner, W.A. For. Dept. Bull. No. 32:72 (1923), referred *T. hadleyana* to this species.

The distinctly discolorous leaves with the markedly shiny upper surface when fresh without domatia yet with two distinct glands near the base of the lamina enables easy separation of this species from other Australian taxa.

The trees are deciduous in the dry season with the new growth and flowering occurs during November.

23. Terminalia aridicola Domin, Biblioth. Bot. 89:446. t. 34. figs. 4-6 (1928). Type: Cloncurry, Nov 1910, K. Domin 6944. (PR 529553). There are no known duplicates of this collection.

Tree or shrub to 10 m high, deciduous. Trunk and branches with dark grey fissured bark. Branchlets pubescent, sometimes sympodial. Leaves spirally arranged, sometimes crowded; glands present at the base of the leaves or on the petioles or both, often obscured by indumentum; lamina coriaceous, discolorous, obovate to broadly elliptical, obtuse or rarely retuse, cuneate at the base, sometimes shortly decurrent, 3-14 cm long, 2.5-10 cm wide, pubescent on both surfaces, sometimes at length glabrescent above; domatia absent; petioles pubescent, 0.5-4 cm long. Spike andromonoecious, male flowers usually at distal end, pubescent, dense or interrupted, shorter than the leaves; bracts oblanceolate to triangular, 1.5 mm long, caducous. Flowers ca5 mm diam., male 5 mm long, perfect ones to 8 mm long. Calyx tube pubescent; lobes triangular ca 2 x 2 mm, puberulous inside, variously clothed outside. Stamens with glabrous filaments 4 mm long. Disc villous. Style glabrous. Mature fruit globular, rarely ovoid, 1.5-2.5 cm diam., usually, with an angle at the apex, beakless, pubescent, drupaceous, green or brown, in cross section showing a well developed broadly spindle shaped core of sclerenchymatous tissue constituting approximately 25 per cent of the diameter and surrounded by a broad ring of succulent tissue with a number of mucilage canals near the core, alveolar tissue absent; compressed with a wing broadening towards the apex and rarely with a short beak when immature.

NORTHERN TERRITORY: 20 miles E of Alexandria Downs, Jun 1948, Perry 1501 (CANB, BRI, NT); SE of Alexandria Downs, May 1947, Blake 17920 (CANB, BRI); 24 miles past Rankin towards Alexandria, Jun 1936, Schoeffe (NSW); 3 miles N of Buchanan Ck, Mar 1956, Chippendale (CANB, BRI, NSW, PERTH, NT); 2 miles from Balbarina, Aug 1965, Newton (BRI, NT); 80 miles S of Borroloola, Apr 1970, Byrnes 1883 (DNA). QUEENSLAND. BURKE DISTRICT: 10 miles S of Morestone Stn, May 1948, Perry 1506 (CANB); 12 miles E of Lawn Hill Stn, Jun 1948, Perry 1416 (CANB, BRI, NSW, PERTH, NT); Adels Grove, Feb 1948, de Lestang 398 (BRI); 30 miles SE of Riversleigh Stn, Jun 1948, Perry 1432 (CANB, BRI, NSW, NT); 4 miles SE of Doomadgee Stn, Jun 1948, Perry 1386 (CANB); 18 miles W of Cloncurry, Feb 1931, Everist & Smith 211 (BRI); Cloncurry, Nov 1935, Blake 10126 (BRI, AD, DNA), and Feb 1931, Hubbard 7391 (BRI); Leilavale, Aug 1928, McGillivray (BRI); Leilavale — Fullerton Rd, Aug 1958, McGillivray 2224 (BRI); 25 miles NE of Hughenden, Jun 1953, Perry 3622 (CANB); 40 miles ENE of Richmond, Jun 1954, Speck 4478 (CANB); 474 miles NW of Pentland, Jul 1954 Blake 19331 (BRI); Saxby R., Aug 1913, Sulman (NSW); 5 miles NW of Croydon, Oct 1968, Williams 199 (BRI). Cook DISTRICT: Gilbert R., Feb 1922, White (BRI), and Mar 1922, Brass (BRI); 5 miles NW of Dimbulah, Apr 1962, McKee 9237 (CANB) & 9250 (CANB, NSW); Chillagoe, Jun 1945, Webb 645 (CANB). NORTH KENNEDY DISTRICT Charters Towers, Shirley (BRI), and Plant (BRI); Charters Towers — Hughenden Rd, Jan 1970, Byrnes 1732 (DNA); 6 miles NE of Pentland, Jun 1953, Perry 3530 (CANB, BRI, NSW); SOUTH KENNEDY DIST-

RICT: 90 miles W of Clermont, Nov 1946, Bisset (BRI); 135 rd miles N of Emerald, Jul 1947, Smith 3162 (BRI); 10 miles NE of Durdan Downs Stn, Aug 1946, Adams 1245 (CANB, BRI).

Range: Queensland north of latitude 24° S. and the Barkly Tablelands area of Northern Territory. The species has not been reported from the coastal areas.

Habitat: The species is found in a wide range of situations but generally favours hilly areas and creek banks in the drier localities.

Observations and Notes: The species exhibits a large variation in leaf size and density of the indumentum with the older leaves sometimes becoming glabrescent above. Flowering occurs in the wet season and often continues into the early dry period. Mature fruit and flowers can be found together in the early dry season and the fruit may hold until the leaves fall in the late dry season.

Specimens without fruit are difficult to separate from specimens of *T. carpentariae* but differ by the domatia being absent and the leaves discolorous. The bark differences are valuable in separating the species.

24. Terminalia chillagoensis Domin, Biblioth. Bot. 89:445 (1928). **Type:** Chillagoe, Nov 1910, *K. Domin* 6942, (PR 929551). There is only one known specimen of this collection.

Tree to 10 m high, deciduous. Trunk and branches with grey, finely fissured, tessellated bark, sometimes with deeper longitudinal fissures. Branchlets appressed pubescent, sometimes glabrescent. Leaves spirally arranged, rarely crowded; glands on the petioles and primary veins; lamina coriaceous, discolorous, broadly elliptical or ovate, obtuse, rarely retuse or shortly acuminate, attentuate at the base, 8-17 cm long, 5-11 cm wide, at first thinly or densely appressed pubescent, glabrescent or retaining scattered weak hairs; domatia small; petioles glabrescent, 2.5-6 cm long. Spike andromonoecious, pubescent, dense, shorter than the leaves; bracts spathulate, to 3 mm long, caducous. Flowers both male and perfect 4-6 mm diam., 4-7 mm long. Calyx tube appressed pubescent or glabrous; lobes glabrous outside, glabrous or thinly pilose inside, triangular ca 1.5 x 1.5 mm. Stamens with glabrous filaments 2-3 mm long. Disc villous. Style glabrous. Mature fruit (fully mature fruit not seen — description drawn from partially mature fruit and known development of fruit of closely related species) glabrous or with scattered weak hairs, globular or ovoid, 1.5-3 cm long, 1.7-2.5 cm diam., with an angle at the apex, beakless, drupaceous, green, in cross section showing a well developed spindle-shaped core of sclerenchymatous tissue constituting approximately 25 per cent of the diameter and surrounded by a broad ring of succulent tissue with a number of mucilage canals near the core, alveolar tissue absent; compressed with prominent lateral wings confluent above, with or without a very short beak when immature.

QUEENSLAND: COOK: Chillagoe, Jan 1918, Michael (BRI), Mar 1964, Freney (BRI); Dec 1967, Cassels (BRI); Nov 1971, Bymes 2414 & 2413 (DNA); Mungana — Chillagoe Rd, Jun 1945, Webb 669 (CANB); 12 miles S of Chillagoe, May 1970, Stocker (DNA); 14 miles S of Chillagoe, May 1970, Stocker (DNA); Alma-den, Nov 1971, Bymes 2415 (DNA); Lappa Jun. — Alma-deh Rd, Nov 1971, Bymes 2412 (DNA); Irvingbank — Petford Rd, Nov 1971, Bymes 2410 (DNA); Mt Molloy — Mt Carbine, Mar 1954, White 716 (BRI); Gilbert R., Georgetown to Croydon Rd, Aug 1913, Cambage 3915 (NSW). MITCHELL DISTRICT Tangorin, ca 70 miles S of Hughendon, Stevens (BRI).

Range: Western slopes of the Great Dividing Range of Northern Queensland mainly near Chillagoe.

Habitat: Open forests usually on sloping skeletal soils.

Observations and Notes: The indumentum on the young leaves and flowers is quite variable but mature leaves and fruit are glabrous or only very thinly clothed and so the species is distinct from the closely related *T. aridicola*.

The trees lose their leaves during August and September and the new growth begins in October with the main flowering period being early November. The fruit mature during the mid or late dry season.

This species is not well collected with half the specimens listed being specially collected for this work in a restricted area. It is probable that the species is more widely distributed than indicated from present collections.

25. Terminalia porphyrocarpa F. Muell, ex Benth. Fl. Aust. 2:501 (1864); F.M. Bail, Qd Fl., 567 (1900), Comp. Cat. Qd Fl. 180 (1913), Qd Woods, 65 (1899); Maiden, Usef. Nat. Pl. Aust. 606 (1889); Domin, Biblioth. Bot. 89:446 (1928).

Type: Mount Archer, Dallachy (lecto: MEL 1005509, isolecto: K).

T. porphyrocarpa F. Muell. ex Benth. var (?) eriantha Benth., Fl. Aust. 2:502 (1864); F.M. Bail., Qd Fl. 566 (1900), Comp. Cat. Qd. Pl. 180 (1913). Type: Mount Archer, Dallachy (holotype, K).

Terminalia thozetii Benth., Fl. Aust. 2:500 (1864); F. Muell., Fragm. 9:160 (1875); F.M. Bail., Qd Fl. 566 (1900), Comp. Cat. Qd Pl. 180 (1913). Type: Rockhampton, Thozet 124 (holotype, MEL).

Myrobalanus porphyrocarpa O. Kuntze, Rev. Gen. Pl. 1:237 (1891), based

on Terminalia porphyrocarpa F. Muell. ex Benth.

Tree to 15 m high, deciduous, Trunk and branches with dark grey tessellated bark. Branchlets densely tomentose, commonly sympodial. Leaves spirally arranged, crowded; glands rare on the petioles, common on the primary veins; lamina subcoriaceous, discolorous, obovate to broadly obovate, obtuse or shortly acuminate, attentuate or shortly attentuate at the base, 3.5-9 cm long, 1.5-5 cm wide, glabrescent above and below or remaining thinly pilose below usually at least on the midvein, minutely verruculose, pellucid punctate; domatia absent; margins slightly recurved; petioles 0.8-1.7 cm long, pubescent. Spike andromonoecious, pubescent, dense, about as long as the leaves; bracts lanceolate to linear, 1-4 mm long, caducous. Flowers male 3-4 mm long, perfect ones 6-7 mm long, both ca 5 mm diam. Calyx usually glabrous inside and outside; tube sometimes pubescent; lobes deltoid ca 2 x 2 mm. Stamens with glabrous filaments ca 4 mm long. Disc villous. Style glabrous. Mature fruit glabrous, ovoid or globular, 1-2 cm long, 0.8-1.5 cm diam., with or without narrow lateral angles confluent above, without beak, sometimes shortly apiculate, green, succulent, in cross section showing a well developed spindle shaped core of sclerenchymatous tissue constituting one third of the diameter, the core containing some small alveolar cells and surrounded by succulent tissue which contains a few mucilage canals adjacent to the core; laterally compressed with two wings confluent above and below when immature. QUEENSLAND NORTH KENNEDY DISTRICT: Charters Towers, Pollock (BRI); Mt Inkerman, Home Hill, Jan 1963, Wyatt 1 (BRI); & Feb 1964 (+ fruit collected) Mar 1964, Wyatt 3 (BRI); Inkerman, Dec 1971, Bymes 2436 (DNA) and Dec 1971, Bymes 2440 (DNA); 12 miles S of Home Hill, Dec 1971, Bymes 2435 (DNA). MITCHELL DISTRICT: Prairie, Dec 1920, Chisholm (NSW); PORT CURTIS DISTRICT: Caves Rd, Rockhampton, Dec 1944, Webb 354 (CANB), Byerly 19 (BRI, NSW), Bailey 13 (BRI, NSW), Macotta (BRI), & Feb 1922, Higgins (BRI); Olsen Caves, Rockhampton, Jan 1954, Webb 560 (CANB, BRI); Rockhampton, in 1903, Simmons (NSW); Milman, Dec 1953, Webb SN 5366 (CANB); Marmor, Mar 1920, Francis (BRI); Yarwun, Jan 1935, Watson (BRI); Port Curtis, Nov 1943, White 12480 (BRI); WIDE BAY DISTRICT: Goodnight Scrub Nov 1955, Epps (BRI); MORETON DISTRICT: Brisbane (cult.), Jan 1969, Simmonds (BRI).

Range: Eastern coast and mountain areas of Queensland between latitudes 20° S and 25° S with isolated occurrences further north.

Habitat: Dense shrubland and open Eucalypt forest commonly in hilly country or near creeks.

Observation and Notes: The Melbourne specimen was selected as the lectotype as it is complete with flower and fruit, was sighted by Bentham and is held in the herbarium where Mueller originally applied the name.

Bentham saw only one specimen with immature fruit from which he described *T. thozetii*. He was not fully aware of the changes that occur in the shape of the fruit in this species although he commented on the possibility of the fruit being immature. In addition the variation in density of the indumentum first recorded by Mueller extends to the leaves and flowers. Variation of these factors were undoubtably the reason for the species being described on two occasions and *T. thozetii* is referred to *T. porphyrocarpa* as it was the name used for the more complete and mature specimens. Because of the above mentioned variability *T. porphyrocarpa* var. (?) *eriantha* cannot be maintained. As indicated by his determinations of the Queensland material, Exell had come to these conclusions.

The leaves of this species resemble those of *T. muelleri* and *T. melanocarpa* but are generally smaller, without domatia, and with thinner petioles. The fruit, when immature is distinctive because of the small size and encircling wing. Fruit at all stages dry black and mature fruit become ridged or winged on drying. The species flowers from early October and the fruit matures quickly.

26. Terminalia melanocarpa F. Muell., Fragm. 3:92 (1862); Benth., Fl. Aust. 2:500 (1864); F.M. Bail., Qd Fl. 566 (1900), Qd Woods 64 (1889); Comp. Cat. Qd Pl. 180 (1913); Maiden, Usef. Nat. Pl. Aust. 605 (1889); Domin, Biblioth. Bot. 89:446 (1928). Type: Edgecombe Bay, Fitzalan (lectotype, MEL 1005510).

Myrobalanus melanocarpa (F. Muell.) O. Kuntze, Rev. Gen. Pl. I. 237 (1891), based on Terminalia melanocarpa F. Muell.

Tree to 15 m high, deciduous. Trunk and branches with dark grey, strongly longitudinally fissured, tessellated bark. Branchlets appressed pubescent, commonly sympodial. Leaves spirally arranged, crowded; glands common at the base of the lamina and towards the ends of the primary veins; lamina coriaceous, discolorous, obovate to broadly obovate, very obtuse, sometimes very shortly acuminate, attenuated at the

base, 5-13 cm long, 4-8 cm wide, thinly pubescent at first, glabrescent, minutely verruculose; domatia absent or rare and minute; petioles appressed pubescent, 0.8-2.5 cm long. **Spike** andromonoecious, dense, as long as or shorter than the leaves, appressed pubescent; bracts lanceolate to linearly triangular, *ca* 1 mm long, caducous. **Flowers** 5-6 mm long, *ca* 6 mm diam. **Calyx** glabrous inside and outside; lobes deltoid 2 x 2 mm. **Stamens** with glabrous filaments 2-3 mm long. **Disc** villous. **Style** glabrous. **Mature fruit** glabrous, ovoid or ellipsoid, 2-3 cm long, 1.5-2 cm diam., usually compressed with distinct lateral angles, apex commonly retuse, beak absent, succulent, green in cross section showing a well developed spindle shaped sclerenchymatous core constituting 30-40 per cent of the diam., with mucilage canals at its outer edge, alveolar tissue absent or small areas irregularly distributed within or surrounding the core, all surrounded by a ring of succulent tissue; laterally compressed with a continuous wing to 5 mm wide when immature.

QUEENSLAND. NORTH KENNEDY DISTRICT: Magnetic I., Jan 1931, Hubbard & Winders 6651 (BRI); Edgecombe Bay, Michael 1235 (BRI); Bowen, Nov 1971, Byrnes 2431, 2432 & 2429 (DNA); Murray Beach, Bowen, Dec 1971, Byrnes 2433 (DNA); Bowen, Dec 1971, Byrnes 2434 (DNA); 10 miles NE of Bowen, Dec 1971, Byrnes 2438 (DNA). PORT CURTIS DISTRICT: Middle Percy I., Mar 1906, Tryon (BRI).

Range: Coastal areas of Queensland between latitudes 20° S and 24° S.

Habitat: On skeletal soil among rocks. Common among granite boulders along the coast.

Observations and Notes: Mueller described material collected by Fitzalan from Edgecombe Bay. The Melbourne specimen is labelled Edgecombe Bay and although Fitzalan's name does not appear on the specimen it is thought to be his and so was chosen as the lectotype. The specimen fits the description which is of fruiting material. A fruiting specimen from Port Denison with Fitzalan's name written in by Mueller may be part of the same collection. It is held at Kew.

Considerable confusion has existed as to the identity of this species. The name has been published for incorrectly determined specimens of *T. ferdinandiana* by Gardner, W.A. For. Bull. No 32: 72, and by Specht and Mountford, Am.-Aust. Sc. Ex. Arnhem Land, 3: 465. The name has been widely applied to *T. arenicola* and incorrect determinations of *T. muelleri* under the name *T. melanocarpa* have been common.

The mature fruit of *T. melanocarpa* is green when fresh and the name was derived from the fact that both mature and immature fruit turn black when dried but this characteristic is not limited to this species. The fruits are somewhat similar to *T. ferdinandiana* but are usually retuse at the apex and the leaves are distinctly different.

In the description of *T. muelleri*, Bentham states "leaves undistinguishable from those of *T. melanocarpa*" and this similarity is the cause of the difficulty in separating these species without fruit. There is a difference in the domatia, with those of *T. muelleri* being common, often visible to the unaided eye and covered by long silky hairs whilst *T. melanocarpa* rarely has domatia and if present are small and often without hairs.

The dimensions of the leaves given by Bentham are considerably larger than those given by Mueller, apparently as a result of observations he made of a number of specimens that he incorrectly determined as belonging to this species. On examination

of these specimens it was found that A. Cunningham's collection from Snapper I. is *T. arenicola*, and the three Robert Brown collections included one piece of each *T. latipes*, *T. platyphylla* and *T. ferdinandiana*. A further specimen from Port Dension was found to be *T. muelleri*.

Further collections from the type locality has enabled a clearer concept of the species which is poorly represented in herbaria.

The trees lose their leaves late in the dry season and new leaves and flowers begin to appear in October or November. Mature fruits have been found in early December on trees growing near the coast while trees found a few miles inland were in early bud.

27. Terminalia complanata K. Schum in K. Schum. & Hollr., Fl. Kais. Wilh. Land 83 (1889); K. Schum. & Laut., Fl. Duetsch. Schutzgeg. Sudsee 466 (1901); Exell, Fl. Mal. 4:563 (1954); Coode, Man. For. Trees Pap. & N.G. pt I (rev.):37 (1969), Cont. Herb. Aust. 2:10 (1973). Type: Finschhafen, in 1901, C. Lauterbach 1138. (Neotype, L 202210).

Tree to 50 m high, deciduous or semi-deciduous. Trunk and branches with smooth or finely fissured bark often peeling in small flakes and with prominent lenticels but sometimes deeply fissured near base of trunk. Branchlets slender, sericeous at first, glabrescent. Leaves spirally arranged; glands sometimes present on primary veins; lamina chartaceous or subcoriaceous, discolorous (shiny above), elliptical, rarely oblong or obovate, acute or shortly acuminate, cuneate at the base, 2-9 cm long, 1.5-4 cm wide, appressed rust brown pubescent when young but glabrescent, minutely verruculose and pellucid punctate; domatia present; petioles glabrescent, slender, 1-1.5 cm long. Spike andromonoecious, dense, generally longer than the leaves, tomentose; bracts filiform, to 2 mm long, caducous. Flowers both male and perfect ca 5 mm diam., 3-6 mm long. Calyx pilose outside; lobes narrowly triangular, 1 x 1.5 mm, glabrous inside. Stamens with glabrous filaments, 2.5-3 mm long. Disc villous. Style glabrous. Mature fruit glabrescent, compressed, ellipsoid, ca 1.7 cm long, 1.6 cm wide, 0.8 cm thick, often apiculate, red to purple, succulent, in cross section showing a small core of schlerenchymatous tissue with irregular well developed radiating arms between which are areas of mucilagenous tissue containing large pockets of mucilage, these structures together constituting ca 80 per cent of diam, and surrounded by a well defined ring of succulent tissue, alveolar tissue absent; sericeous, and with distinct lateral ridges when immature.

QUEENSLAND. COOK DISTRICT: Iron Range, Jun 1948, *Brass* 19149 (CANB, BRI); McIlwraith Ra., Dec 1948, *Volk* 4239 (Q.F.D. ATHERTON); Claudie R., Oct 1972, *Hyland* 6426 (F.R.I. ATHERTON). New Guinea: Gumin R., Milne Bay, Mar 1970, *Henty & Katik* (NFG, DNA); near Wau, Aug 1970, *Byrnes* 1960 (DNA).

Range: AUSTRALIA: Iron and McIlwraith Ranges of Cape York Peninsula, Queensland. MALAYSIA: New Guinea, New Britain and Solomon Islands.

Habitat: Rainforest.

Observations and Notes: The holotype, Mentzel n. 3 from Finschhafen was destroyed in Berlin (correspondence C.G.J. van Steenis). On request Dr. van Steenis selected a specimen from collections annotated by K. Schumann to be nominated as the

neotype. The specimen selected was also from Finschhafen collected by C. Lauterbach. Note of this selection of the neotype was published by Coode in Cont. Herb. Aust. 2:10 (1973).

The compressed fruit with its thick ridges, either when immature or dry, together with the short point at the apex, distinguishes this species from others found in Australia. As there is only two fertile collections to date of Australian material the above description was in part from New Guinea material. The Australian specimens matched the New Guinea material very well but were generally a little smaller in most structures.

28. Terminalia erythrocarpa F. Muell., Fragm. 2:150 (1861); Benth., Fl. Aust. 2:503 (1864); Ewart & Davies, Fl. N. Terr. 213 (1917). Type: Upper Victoria River, *F. Mueller* (K, holo).

Shrub or small tree to 10 m high, deciduous. Trunk and branches with light grey, finely fissured rough bark without deep grooves. Branchlets appressed pubescent early, glabrescent, commonly sympodial. Leaves spirally arranged, not crowded; glands small, on petioles and primary veins; lamina subcoriaceous, discolorous, narrowly to broadly elliptical or rectangularly lanceolate, acute or shortly acuminate, narrowly cuneate at the base, 9-20 cm long, 2-6 cm wide, glabrous or with a few scattered hairs, minutely pellucid-punctate; domatia microscopic; petioles glabrescent, 2.5-7 cm long. Spike andromonoecious with the male flowers restricted to the distal end, interrupted, glabrescent, shorter than the leaves; bracts narrowly elliptical to 3 mm long, caducous. Flowers 5 mm diam., male 3-4 mm long, perfect ones 5-6 mm long. Calyx glabrous inside and outside; lobes deltoid, ca 2 x 2 mm with a dark midline. Stamens with glabrous filaments 2 mm long. Disc villous. Style glabrous. Mature fruit glabrous, ovoid, ca 1.5 cm long, 1 cm diam., distinctly beaked, red, succulent, in cross section showing a broadly spindle shaped sclerenchymatous core constituting less than 30 per cent of the diam, surrounded by a corky inner ring containing some alveolar tissue with the spaces lined with red resin and an outer ring consisting of radiating mucilagenous cells, mucilage canals absent; smaller, green but similar in shape when immature.

NORTHERN TERRITORY: 2 miles SW of Victoria Downs Stn, Jun 1949, Perry 2090 (CANB, BRI, NSW, PERTH); Flora R. Oct 1946, Blake 17225 (CANB, BRI); Daly R. near Police Stn, Oct 1962, Muspratt 84 (CANB, NSW, NT, DNA), and Chippendale (BRI, NT); Douglas R., Sep 1964, Lazarides 7022 (CANB, BRI); Douglas R. Ooloo Rd, Mar 1964, Robinson R295 (DNA); Claravale Stn, May 1964, Robinson R469 (NSW, PERTH, DNA); Katherine R., Oct 1948, Chippendale (BRI, NSW, AD, PERTH, NT); Katherine, Oct 1946, Blake 17196 (CANB, BRI); Katherine R., C.S.I.R.O. Exper. Farm, Dec 1963, Adams 809 (CANB, BRI, NSW); Katherine Gorge, Jan 1967, Byrnes 79 (DNA); Elsey Stn, Mar 1947, Wynn 16 (CANB); Bradshaw Ck, Oct 1946, Blake 17297 (CANB, BRI); Adelaide River township, Mar 1970, Harpley (DNA); Coomalie Ck, Oct 1968, Byrnes 936 (DNA), Dec 1964, Robinson 1075 (DNA), Mar 1970, Byrnes 1791 (DNA), and Apr 1968, Byrnes 558, (BRI, NT); South Alligator R., May 1970, Byrnes 1921 (DNA).

Range: North and north-western areas of the Northern Territory.

Habitat: On banks of creeks or rivers with permanent water or with a high water table in the gravel or sand of the river bed throughout the year. The trees usually overhang the main channels.

Observations and Notes: As Mueller wrote "all that is saved" on the label of the sheet of type material it is assumed that this is all that remains of the original collection and so is the holotype.

Determination of this species is relatively easy because it differs greatly in leaf shape and fruit characters from other Australian species.

Flowering begins in early October and continues into the early wet season. From February to June the fruit ripens and falls commonly into water which assists in its distribution. Fish often eat the fruits but only the succulent tissue is removed and the seed will germinate if the fruit is allowed to dry out.

29. Terminalia sericocarpa F. Muell., Fragm. 9: 159 (1875); F.M. Bail. Qd Fl. 586 (1900), Comp. Cat. Qd Pl. 180 (1913); Specht and Mountford, Am. - Aust. Sc. Exp. to Arnhem Land 3: 266, 401 & 465 (1958). **Type:** Rockingham Bay, *Dallachy* (lectotype MEL 1005507).

Tree to 30 m high, deciduous. Trunk with black or grey tessellated bark strongly fissured longitidunally. Branches rugose with fine fissures. Branchets strongly sympodial, with short appressed pubescence. Leaves spirally arranged, not crowded; glands absent; lamina sub-coriaceous, discolorous (shiny above), obovate to broadly oboyate or elliptical, obtuse or commonly shortly acuminate, narrowly cuneate or attenuate at the base, sometimes decurrent, very variable in size, 2-20 cm long, 1.5-8 cm wide, glabrescent early, minutely verruculose, pellucid - puncate, with strong transverse veins between primary veins; domatia present, petioles pubescent, 0.2-1.5 cm long. Spike andromonoecious, pubescent, dense or interrupted, longer or shorter than leaves; bracts narrowly triangular, 1-2 mm long, caducous. Flowers both male and perfect 3-4 mm long, ca 5 mm diam. Calvx sericeous outside; lobes triangular, 1.5 x 2 mm, narrowly acute or acuminate, glabrous or with scattered silky hairs inside. Stamens with glabrous filaments, 2-3 mm long. Disc and style villous. Mature fruit thinly sericeous, glabrescent, ovoid, slightly compressed, 1.3-1.8 cm long, 0.8-1 cm wide, obscurely angled, succulent, red or purple, in cross-section showing a well developed irregularly outlined elliptical sclerenchymatous core constituting 50-60 per cent of the diam., surrounded by a ring of succulent tissue with a few mucilage canals adjacent to the core, alveolar tissue absent; compressed with two lateral angles or ridges and apiculate, often capped with the remains of the flower, sericeous and green when immature.

WESTERN AUSTRALIA: ca 15 miles S of Kalumburu May 1971, Byrnes 2297 (DNA); 60 miles N of Kununurra, Oct 1970, Byrnes 2007a & b (DNA). NORTHERN TERRITORY: N of Forster Block, Oct 1962, Muspratt SS078 (BRI, DNA); Green Ant Ck — East Springs, Sep 1968, Byrnes 926 (DNA); Nightcliff, Feb 1961, McKee 8281 (BRI, NSW); Holmes Jungle, Apr 1969, Byrnes 1634 (DNA); Port Darwin, in 1885, Holtze 9 (MEL); Port Darwin, in 1885, Holtze 48 (MEL), in (?)1885, Holtze 50 (MEL); Melville I., May 1966, Stocker (BRI); 12° 39'S, 131° 20'E., Sep 1946, Blake 16971 (CANB, BRI); Coomalie Ck, Oct 1967 Byrnes 526 (AD, DNA), and Oct 1968, Byrnes 935 (DNA); Beatrice Hill, Dec 1968, Byrnes 1220 (DNA); Marraki — Scotts Ck, Oct 1964, Robinson R929 (DNA); Forestry Block, Woolner Rd, Nov 1971, Must 867 (DNA); East Alligator R., Sep 1970, Byrnes 1970 (DNA); Oenpelli, Oct 1948, Specht 1186 (CANB, BRI, NSW, AD, PERTH), and Dec 1962, Beens & Spence (BRI); Black Point, Coburg Pen., Oct 1968, Byrnes 1102 & Maconochie (AD, DNA); Groote Eylandt, Oct 1963, Stocker (BRI). Queensland: Cook District. Lockerbie, Dec 1962, Hyland 2535 (BRI); Bamaga, in 1962, Webb & Tracey (BRI); Cooktown—

McIvor Rd, Webb (BRI); 50 miles S of Weipa, in 1962, Webb & Tracey 8190 (BRI); Daintree, Nov 1954, Blake 19739 (BRI); Upper Daintree, Nov 1971, Byrnes 2463 (DNA); Freshwater Ck, Cairns, Dec 1966, Brass 33504 (BRI); Kamerunga, Jan 1892, Cowley (BRI); Yarrabah, in 1918, Michael (BRI); Barron R., Oct 1945, Blackburn (NSW); Hallorans Hill, Atherton, Nov 1953, White (BRI); Atherton, Nov 1964, Martin (BRI); Yungaburra, Nov 1971, Byrnes 2463 (DNA); Little Mulgrave, Aug 1954, Jones 1320 (CANB); Bellender Ker, Nov 1947, Cutuli (BRI); North Kennedy District: Dunk I., Jan 1915, Banfield (NSW); Mt Elliott, Fitzalan (lectoparatype, MEL); Bowen District, Young (BRI); SOUTH KENNEDY DISTRICT: 8 miles S of Sarina, May 1927, Francis (BRI); PORT CURTIS DISTRICT: Rockhampton, Thozet (lectoparatype, MEL).

Range: Coastal areas and nearby hills from near Kalumburu in Western Australia to the Fitzroy River in Queensland.

Habitat: In rainforests or along the banks of rivers or larger creeks. It commonly borders rainforest and occasionally can be the dominant species in small pockets.

Observations and Notes: Of the three specimens cited by Mueller the one chosen as the lectotype matches the description and is the best preserved of the three collections.

The marked transverse veining on the shiny upper surfaces of the leaf combined with the small sericeous fruit separate this species from all other Australian species but the species closely resembles *T. microcarpa* Dcne. from Malasia. It differs from the New Guinea material seen to date by having much more acute calyx lobes, more hairy fruit and rougher bark on the trunk. Consideration could be given to the combination of these two species once the variation within them has been thoroughly investigated.

The trees are leafless for a short period usually in September and flowering follows shortly after with the new growth. The flowering is profuse and produces an unpleasant perfume. Fruit ripen from January to May and the species is one of the few that the leaves become brightly coloured before they fall. The trees have the "pagoda" shape when young and are occasionally planted as specimen trees for this reason.

HYBRIDS. Hybridization is not common among the Australian species of *Terminalia*. However in the closely related *T. canescens* and *T. pterocarya* there appears to be some intergradation of the species which could be attributed to hybridization.

One specimen from Woodcutters Prospect, 10 miles NE of Batchelor, W.F. Ridley (BRI 82169), is apparently hybrid of T. platyphylla and T. ferdinandiana as it shows characters of both species, both of which are common in the area. No further trees matching this one could be found in the locality. A further two specimens collected at Nangalola by Dr H. Reeves (459 & 515) possibly from the same tree appear to be a similar hybrid.

Some specimens determined as *T. aridicola* from the south eastern Gulf of Carpentaria show some characters in immature fruit of *T. carpentariae* which may also indicate some hybridization but the specimens were insufficiently complete for proper assessment of this possibility.

SPECIES WITH UNSUBSTANTIATED AUSTRALIAN DISTRIBUTION.

T. microcarpa Done. was reported as being collected in N. Australia by the Baudin's Expedition. This was questioned by Bentham in Fl. Aust. 2:502 in his notes following

the description of the species. To date no specimen has been found within Australia that can positively be determined as *T. microcarpa*.

DISTRIBUTION OF SPECIES. There are large areas of northern Australia poorly explored botanically and it is expected that the distribution given for most species will be extended with further exploration. Because of the lack of adequate collecting additional species may be found, with the most likely area being in the rainforests of Cape York Pen.

MACROPTERANTHES F. Muell., Fragm. 3:91 (1862); Benth., Fl. Aust. 2:504 (1864); F.M. Bail., Qd. Fl. 569 (1900); Exell, J. Bot. 69:128 (1931); Exell & Stace, Bol. Soc. Brot. 40:2:24 (1966).

Shrub or small tree evergreen. **Indumentum** of compartmented hairs, few non-compartmented in *M. leichhardtii*, some species partly glabrescent. **Leaves** sessile or with very short petioles, spirally arranged and usually crowded or distinctly petiolate, opposite and distant, coriaceous or chartaceous, without glands or domatia. **Flowers** perfect, actinomorphic, in pairs or rarely solitary on axillary peduncles. **Receptacle** not externally differentiated but upper part produced to form a tube beyond the ovary, bearing two persistent adnate bracteoles and terminating in a usually five lobed persistent calyx. **Petals** pubescent, attached at the base of the calyx lobes, deciduous. **Stamens** 10, adnate to the calyx tube; anthers versatile. **Disc** narrow, cupular. **Style** persistent. **Ovules** 6 - 12, pendulous. **Fruit** a pseudocarp, dry, conical, with two enlarged chartaceous winglike bracteoles; seed one (or commonly sterile) without endosperm, cotyledons convolute.

The genus consists of four species and is restricted to Australia. Due to the long dry periods common in the areas where members of the genus are found, the shrubs may lose a large proportion of their leaves. Of more than sixty mature fruits examined of the two species, *M. kekwickii* and *M. montana*, only four contained seed and only three of these were viable. There were no reasons to believe that these collection were atypical.

KEY TO SPECIES

1. Leaves sessile or nearly so, isobilateral and crowded on small branchlets
Leaves petiolate, dorsiventral and distant
2. Bracteoles of fruit exceeding the length of the calyx
Bracteoles of fruit much shorter than the calyx
3. Mature leaves glabrous on both surfaces
Mature leaves with indumentum at least on the lower surface 4. M. leichhardtii

Macropteranthes kekwickii F. Muell., Fragm. 3:151 (1863); Benth., Fl. Aust.
 2:504 (1864); Ewart & Davies, Fl. N. Terr. 213 (1917). Type: Newcastle Waters, Lat. 17° 30'S, in 1862, Kekwick, Stuart's Expedition, (lectotype, MEL 1005523, name misspelt M. 'keckwickii' on lectotype sheet; isolectotype, K).

Shrub to 6 m. Branches divaricate. Branchlets mostly very short, pubescent. Leaves spirally arranged, usually densely crowded; lamina concolorous, coriaceous,

lanceolate to rectangular, obtuse, minutely mucronate, attenuate at the base, 3-11 mm long, 1.5-4 mm wide, densely silvery pubescent; petioles absent or to 1.5 mm long, pubescent. **Inflorescence** of paired, rarely single flowers; peduncles pubescent, 0.2-1.2 cm long; bracts broadly ovate or nearly circular, 3-4 mm long, dedicuous. **Flowers** perfect, sessile. **Calyx** sericeous, 4-6 mm long with pubescent bracteoles, 3-4 mm long. **Corolla** free; petals pubescent, ovate, *ca* 4 mm long. **Stamens** with glabrous filaments, *ca* 4 mm long. **Disc** pubescent. **Style** pubescent near the base. **Fruit** dry, conical, terminating with the enlarged calyx lobes, 1-1.5 cm long; bracteoles winglike, broadly elliptical to orbicular, exceeding the calyx lobes, 1.2-1.5 cm long, 1-1.5 cm wide, thinly appressed pubescent, glabrescent, straw yellow.

NORTHERN TERRITORY: 14 miles SW of Birrimbah, Jun 1949, Perry 2061 (CANB, BRI, NSW), 52.2 miles S of Willeroo Hsd, May 1960, Chippendale (NT, NSW, AD, NT); 6 miles W of old No. 10 Bore Murranji S.R., Jul 1956, Chippendale (CANB, NSW, NT); 50 miles W of Stuart Hgy, Top Springs Rd, May 1969, Bymes 1592 (DNA); 210 miles (rd) S of Katherine, Nov 1968, Bymes 1174 (DNA); 10 miles S of Daly Waters, Feb 1969, Bymes 1355 (DNA); 54 miles E of Daly Waters, Mar 1972, Bymes 2561 (DNA); Dunmarra, Jun 1946, Blake 16026 (CANB, BRI) 5 miles NW of Elliott, Mar 1955, Winkworth 1049 (CANB, BRI); 5 miles W of Elliott, Feb 1968, Maconochie 576 (NSW, AD, NT); Elliott, Jul 1947, Perry 237 (CANB); 1 mile S of Elliott, Aug 1948, Perry 1932 (CANB, BRI, NSW); 28 miles S of Elliott, Jan 1964, Nelson 1237 (NSW, NT); 95 miles N of Newcastle Waters, Feb 1969, Must (BRI); 26 miles N of Newcastle Waters, Mar 1969, Bymes 1449 (DNA); 24 miles N of Newcastle Waters, Mar 1955, Chippendale (CANB, BRI, NSW, NT); 16 miles W of Newcastle Waters, Jul 1959, Lazarides 6271 (CANB, NSW); Newcastle Waters, Jul 1911, Hill (NSW); E of Newcastle Waters, in 1902, Spencer (NSW); Frew Ponds, May 1881, Stirling (AD); October Ck, Borroloola Rd, Mar 1972, Bymes 2552 (DNA); 115 miles (rd) E of Daly Waters, Mar 1972, Bymes 2545 (DNA); Northern Territory, in 1951, Carter 2634 (BRI).

Habitat: In shallow depressions or on gently sloping ridges in semi-arid areas usually associated with either Terminalia volucris or Acacia shirleyi

Range: Northern Territory between latitudes 16°S and 18°S. and longitudes 131°E. and 135°E.

Observations and Notes: The Kew material of the *Macropteranthes* types (one of each species) was examined by Mr. G. Chippendale and his comment in correspondence was "all appear to be fragments broken from a larger specimen" and for this reason the Melbourne specimens were selected as lectotypes of all species. Although this species is vegetatively similar to *M. montana* the flowers and fruit are markedly different. Flowering usually occurs during March or April with mature fruits falling in the late dry season. It is known as Bulwaddy.

2. Macropteranthes montana (F. Muell.) F. Muell., Fragm., 3: 91 (1862); Benth., Fl. Aust. 2: 504 (1864); F.M. Bail, Qd Fl. 570 (1900), Comp. Cat. Qd Pl., 180 (1913); Domin, Biblioth. Bot. 89: 1001 (1928) based on Lumnitzera montana F. Muell., Fragm. 2: 149 (1861). Type: Newcastle Range, Tropical Australia, in 1856, F. Mueller (lectotype, MEL1005519; isolectotype, K).

Shrub to 6 m. **Branches** divaricate. **Branchlets** mostly short, pubescent. **Leaves** spirally arranged, usually densely crowded; lamina concolorous, coriaceous, lance-olate to rectangular, obtuse, minutely mucronate, attenuated at the base, 5-8 mm long, 1-2.5 mm wide, densely silvery pubescent; petioles absent or less than 1.5 cm long

pubescent. Inflorescence of paired flowers; peduncles pubescent, ca 3 mm long; bracts broadly ovate, 2-4 mm long, deciduous. Flowers perfect, sessile on pedicels to 1 mm long. Calyx villose 1-1.5 cm long with villous bracteoles 5-10 mm long. Corolla free, petals villous, elliptical acute, 6-8 mm long. Stamens with glabrous filaments 1.5-2.5 cm long. Disc villous. Style thinly villous at the base. Fruit dry, conical or funnelform terminating with the enlarged calyx lobes, 2.2-2.5 cm long; bracteoles winglike, broadly elliptical or orbicular, shorter than the enlarged calyx, 1-2 cm long, thinly villous; glabrescent, red at first, bleaching straw yellow.

QUEENSLAND COOK DISTRICT: Chillagoe, Jan 1931, Hubbard & Winders 6817 (BRI), and Dec 1967, Cassels (BRI) Emu Ck, Walsh R., Millar (BRI); Lappa Junction, Jun 1937, Thurston 186 (BRI); 6 miles from Petford on Herberton Rd, Apr 1962, McKee 9426 (CANB, BRI, NSW); Irvinebank — Petford Rd, Nov 1971, Byrnes 2411 (DNA); 13 miles NW Irvinebank, May 1952, Everist 5154 (CANB, BRI); Herberton, May 1913, Hamilton (NSW); Mt Albion, in 1899, Dixon (NSW); Mt Babinda, Oct 1947, Stephens (NSW); (?)Jul 1927, Pollock (BRI).

Habitat: Skeletal soils usually on stony slopes in the drier monsoonal areas.

Range: Western slopes of the Atherton Tablelands, Queensland.

Observation and Notes: The Melbourne specimen was selected as the lectotype because the Kew specimen appears to be a fragment. (see under *M. kekwickii*). This was the only species included under *Lumnitzera* sect. *Macropteranthes* by Mueller. It was later raised to generic status by him, and is therefore the type species for the genus.

Macropteranthes fitzalanii F. Muell., Fragm. 8: 160 (1874); F.M. Bail., Qd Fl. 570 (1900), Qd Woods, 65 (1899), Comp. Cat. Qd Pl., 180 (1913). Type: Port Denison, Fitzalan (MEL 1005516, lectotype; K, isolectotype).

Shrub or small tree to 7 m high, evergreen. Branches erect. Branchlets appressed pubescent at first, glabrescent. Leaves opposite, not crowded; lamina discolorous, chartaceous, broadly elliptical or orbicular, retuse, rarely obtuse, usually minutely mucronate, shortly attenuated at the base, 1.5-4 cm long, 1-3 cm wide, appressed pubescent at first but soon glabrescent, minutely verruculose above; petioles appressed pubescent, glabrescent, 0.4-0.8 cm long. Inflorescence usually two flowered; peduncles 0.5-0.8(-2.5) cm long, appressed pubescent; bracts cordate or orbicular, 2-3 mm long, deciduous. Flowers perfect on pedicels ca 4 mm long. Calyx tube glabrous; lobes pubescent; both together ca 1 cm long with two obovate, minutely verruculose, glabrous bracteoles as long as the calyx. Corolla free; petals broadly obovate shortly acuminate, 5-7 mm long, pubescent. Stamens with glabrous filaments ca 6 mm long. Disc villous. Style glabrous. Fruit dry, narrowly conical or funnelform, terminating in the enlarged calyx lobes, 1.6-2.5 cm long; bracteoles winglike, obovate, as long as the calyx, 0.6-1.2 cm wide, glabrous, straw-coloured.

QUEENSLAND. NORTH KENNEDY DISTRICT: Shute Harbour, Jan 1965, Webb & Tracey 7912 (BRI); Mt Dryandra, Michael (BRI); Proserpine, Feb 1935, No. 15 (BRI). PORT CURTIS DISTRICT: Bajool, Jan 1915, White (BRI), and Sep 1950, Webb 2209 (CANB, JCT); Raglan — Marmor, May 1960, Jones 1460 (CANB); Marmor, Feb 1920, Francis (BRI); Port Curtis, Nov 1943, White 12481 (BRI).

Habitat: Poorer soils in the coastal summer rainfall areas.

Range: Coastal areas of Queensland between latitude 20°S and 24°S.

Observations and Notes: The Melbourne specimen was selected as the lectotype as the Kew specimen appears to be a fragment. (see under M. kekwickii).

The description above is based on limited material, particularly of flowering specimens and it is expected that the description may need to be altered in some details as further collections become available.

The glabrous mature foliage enables easy recognition of this species from the other members of the genus.

4. Macropteranthes leichhardtii F. Muell., Fragm. 3:91 (1862); Benth., Fl. Aust. 2:505 (1864); F.M. Bail., Qd Fl. 570 (1900), Comp. Cat. Qd Pl. 180 (1913). Type: Ruined Castle Creek, 7 Feb 1847, Leichhardt (lectotype MEL 1005518; isolectotype, K).

Shrub to 7 m high, evergreen. Branches erect, spreading. Branchlets densely pube-scent. Leaves opposite, not crowded; lamina discolorous, minutely mucronate, attenuated or shortly attenuated at the base 1.2-4.5 mm long, 0.7-2.2 mm wide, at first densely pubescent, glabrescent at least on the upper surface; margins recurved; petioles appressed pubescent, 0.3-0.7 mm long. Inflorescence usually two flowered; peduncles to 1 cm long, appressed pubescent; bracts cordate to very broadly ovate, ca 1 mm long, caducous. Flowers perfect on pedicels 1-7 mm long (not seen at anthesis). Fruit dry, narrowly conical or funnelform, terminating in enlarged lobes, 0.8-1.3 cm long, densely pubescent; bracteoles winglike, broadly elliptical to circular, thinly pubescent or glabrescent, as long as or shortly exceeding the calyx, 0.6-1.2 cm long, straw coloured.

QUEENSLAND. LEICHHARDT DISTRICT: 3 miles E of Metro Stn, Jun 1964, Adams 1012 (BRI, NSW, CANB); 8 miles SE of Tanderra Stn, Jun 1964, Adams 1018 (NSW, CANB); 3 miles SSE of Rutland Stn, Jun 1964, Adams 1030 (BRI, CANB, AD); Meteor Park Hsd, Oct 1962, Story & Yapp 311 (NSW, CANB); 35 miles S of Springsure, Jul 1963, Wetherall 15 (BRI); Buckleton, Springsure, McLaughlin (BRI); Gindie, Aug 1916 Francis (BRI); Emerald — Rockhampton, Woods (BRI); W of Moura, Oct 1961, Jones 1771 (CANB).

Habitat: In semi-evergreen vine thickets on rounded crests in brigalow country. **Range:** Watershed of the Fitzroy River and its tributaries, Queensland.

Observations and Notes: The petiolate leaves with indumentum on the lower surface distinguishes this species from the other members of the genus. This indumentum is reported by Stace in J. Linn. Soc. (Bot.), 59:378:234 as being composed of both simple and compartmented hairs and this condition has only been found in one other species in the family. It is known as bonewood.

The Melbourne specimen was selected as the lectotype because the Kew specimen appears to be a fragment. (see under M. kekwickii).

Lumnitzera Willd., Neue Schr. Ges. Naturf. Fr. Bel. 4:186 (1803); Sloot., Bijdr. Combr. 26 (1919), Trop. Natuur. 11:54:65 (1922), Bull. Jard. Bot. Btzg. 3:6:43 (1924), Blumea Supp. 1:162 (1937); Exell, J. Bot. 69:128 (1931) (lists synonymy), in van Steenis, Fl. Mal. 4:585 (1954); Benth. Fl. Aust. 2:503 (1864); F.M. Bail., Qd Fl. 569 (1900); Coode, Man. For.

Trees Papua and N.G. 1(rev.): 79 (1969). Pyrrhanthus Jack, Mat. Mizc. 2:7:57 (1822).

Shrubs or small trees, evergreen. Leaves spirally arranged, sessile or nearly sessile, fleshy, coriaceous, entire, glabrescent. Flowers perfect, 5-merous, actinomorphic, red, white or yellow, in short terminal or axillary spikes or racemes. Receptacle not externally differentiated into an upper and lower part but produced to form a tube beyond the ovary, bearing two adnate persistent bracteoles and terminating in a five lobed persistent calyx. Petals caducous. Stamens 5-10 borne on the inner wall of the receptacle tube; anthers versatile. Disc absent or inconspicuous. Style filiform, persistent, not adnate to the wall of the receptacle. Ovules 2-5. Fruit compressed ellipsoid, obscurely angled, more or less woody, crowned by persistent calyx. Seed with convolute cotyledons.

The description of the genus is modified from Exell.

The genus is found in East Africa, Asia, Malaysia, Northern Australia and Polynesia. There are two species and both are found in Australia.

KEY TO THE SPECIES

- 1. Flowers red, shortly pedicellate, in terminal inflorescences
 1. L. littorea

 Flowers white (? yellow), sessile, in axillary inflorescences
 2. L. racemosa
- 1. Lumnitzera littorea (Jack) Voigt, Hort. Suburb. Calc. 39 (1945); Meeuse in Back., Fl. Java, (em. ed.) 4 fam. 101:8 (1944); Exell in van Stennis, Fl. Mal. 4:586 (1954); Coode, Man. For. Trees Papua and N.G. 1(rev.):81 (1969); Specht & Mountford, Am. Aust. Sc. Exp. Arnhem Land 3:265 (1954).

Based on *Pyrrhantus littoreus* Jack, Mal. Misc. 2: no. 7: 57 (1822). **Type:** not traced.

Lumnitzera coccinea W. & A., Prod. 316 (1834); F. Muell., Fragm. 9:160 (1875); Benth., Fl. Aust. 2:503 (1864); F.M. Bail., Qd Fl. 569 (1900), Comp., Cat. Qd Pl. 180 (1913).

Lagunculatia purpurea Gaud. in Freyc., Voy Bot. 481 (1826).

Lumnitzera purpurea Presl., Rep. Bot. 1:155 (1934).

Shrub rarely tree to 10 m, evergreen. Trunk and branches with longitudinally fissured, black bark. Branchlets glabrous. Leaves spirally arranged, usually crowded; lamina coriaceous, fleshy, concolorous, obovate, retuse, cuneate at the base, 2-8 cm long, 1-2.5 cm wide, glabrous; margins entire or sometimes appearing crenate due to glands irregularly spaced along the leaf edge; petioles absent or to 5 mm long. Inflorescence a raceme, terminal. Flowers red, shortly pedicelled (to 3 mm). Receptacle glabrous, tubular or funnel-shaped, slightly compressed 8-12 mm long, with two ovate bracteoles less than 1 mm long. Calyx lobes broadly ovate ca 1 mm long. Petals red, glabrous, oblong or elliptical, 4-5 mm long, 1.5-2 mm wide. Stamens 5-10 with glabous filaments to 1 cm long. Style glabrous, to 1 cm long. Fruit glabrous,

1-1.5 cm long including the persistent calyx lobes, 4-5 mm wide below the middle, slightly compressed, finely striated and retaining the small bracteoles.

NORTHERN TERRITORY: Yirrkala, Aug 1948. Specht 802 (CANB, BRI, NSW, AD). QUEENSLAND. COOK: Cape York near Jacky Jacky Airstrip, Nov 1966, Jones (BRI); New Holland, in 1770, Banks & Solander (NSW); Cucania, Aug 1959, Jones 1321 (CANB, BRI); Yarrabah, in 1918, Michael 586 (BRI); near Hinchinbrook, Aug. 1961, Jones (BRI); Hinchinbrook I. Sep 1968, Jones (BRI); Hinchinbrook Lookout, Jun 1969, Jones (BRI); Hinchinbrook Passage, Nov 1971, Byrnes 2428 (DNA); 10 miles N of Ingham, Oct 1971, Winkle (BRI); mouth of Seymour R. Jul 1963, Jones (BRI), and Jul 1968 Jones (BRI).

Habitat: Inland side of mangrove swamps, usually in areas which are inundated only by the higher tides.

Distribution: Tropical Asia, Malaysia, Northern Australia and Polynesia.

Observations and Notes: To date the type specimen has not been traced. Jack's collections from Malaya and Sumatra were dispersed to various herbaria but this species is not represented in the herbaria of Kew, Edinburgh or British Museum where the majority of his collections may be found.

The synonymy of this species has been discussed in a number of publications since Wallich suggested that *Lumnitzerra coccinea* and *Pyrrhanthus littoreus* should be united (see Wight, Prod. Fl. Pen. Ind. Orient. 1:316 (1834)) and there is general agreement that the nomenclature is as stated above.

The terminal racemes of red flowers enable easy determination of this species but sterile material is very similar to that of *L. racemosa*. The presence of an indumentum on the very young leaves indicates that the species is *L. racemosa* but glabrous young leaves do not necessarily mean that the specimen is *L. littorea*. This species is the rarer of the two.

2. Lumnitzera racemosa Willd. var. racemosa Neue Schr. Ges. Naturf. Fr. Berl. 4: 187 (1803); Exell in van Steenis, Fl. Mal. 4: 588 (1954); Fitzgerald, J. Roy. Soc. W.A. 3: 185 (1918); Benth., Fl. Aust. 2: 504 (1864); F.M. Bail., Qd Fl. 569 (1900), Qd Woods, 65 (1899), Comp. Cat. Qd Pl. 180 (1913); Ewart & Davies, Fl. N. Terr. 212 (1917); Coode, Man. For. Trees Papua & N.G. I(rev.): 81 (1969); Meeuse in Back. Fl. Java (em. Ed.) 4, fam. 101: 8 (1944); Specht & Mountford, Am. — Aust. Sc. Exp. Arnhem Land, 3: 265 (1954); Domin, Biblioth. Bot. 89: 1001 (1928). Type: India, in 1795, Klein (holotype, B), labelled as Jussieu racemosa.

Lumnitzera racemosa var. pubescens Koord. & Val., Bijdr. Booms., 9:34 (1903)

Petaloma alba Blanco, Fl. Pilip., 344 (1837).

Petaloma alternifolia Roxb., Fl. Ind., 2:372 (1832).

Bruguiera madagascariensis DC., Prod., 3:23 (1828).

Laguncularia rosea Gaud. in Freyc., Voy. Bot., 481 (1826):

Lumnitzera rosea Presl, Rep. Bot., 1:155 (1834).

Shrub to 8 m high, evergreen. Trunk and branches with longitudinally fissured,

dark grey bark. **Branchlets** appressed pubescent at first, glabrescent. **Leaves** spirally arranged, often crowded; lamina coriaceous, fleshy, concolorous, obovate, retuse, cuneate at the base, 2-9 cm long, 1-2.5 cm wide, glabrous or glabrescent early; margins entire or sometimes appearing crenate due to glands irregularly spaced along leaf edge; petioles absent or to 1 cm long. **Inflorescence** a short spike, axillary. **Flowers** white, sessile. **Receptacle** glabrous, tubular or narrowly urceolate, slightly laterally compressed, usually contracted above the middle, 6-8 mm long, with two broadly ovate bracteoles *ca* 1.5 mm long. **Calyx** lobes broadly ovate, acuminate (? gland tipped), *ca* 1 mm long. **Petals** white, glabrous, narrowly elliptical or oblanceolate, to 4 mm long, *ca* 1 mm wide. **Stamens** 10, *ca* as long as the petals. **Style** glabrous, to 7 mm long. **Fruit** glabrous 1-1.5 cm long, 3-5 mm wide below the middle, slightly compressed, finely striated in the upper part, retaining the small bracteoles.

Western Australia: Sunday I., Nov 1906, Fitzgerald (NSW); 6 miles SW of Beagle Bay Mission, Sep 1959, Lazarides 6566 (CANB, NSW). Northern Territory: Melville I., Apr 1966, Stocker & Fox (BRI); Darwin, Oct 1946, Blake 17336 (CANB, BRI); Rapid Ck, Nov 1971, McKean 856 (DNA); Buffalo Ck, Darwin, Feb 1970, Bymes 1780 (DNA); Knocker Bay, Coburg Pen., Nov 1970, Must 620 (BRI, NT); Gove, Aug 1948, Specht 946 (BRI); Groote Eylandt, May 1948, Specht 440 (CANB, BRI, NSW). Queensland. Cook District: Cape York, Jones (BRI); Low I., May 1963, Cribb (BRI); Port Douglas, Dec 1932, Brass 1910 (BRI); Daintree R., Dec 1929, White 1452 (BRI); 25 miles N of Cairns, Nov 1971, Bymes 2418 (DNA); Cairns, Nov 1960, Jones (BRI); Machens Beach, Jones (BRI). North Kennedy District: Mission Beach, Jul 1959, Jones 1265 (CANB); Hinchinbrook, June 1960, Jones (BRI); Magnetic I., Jan 1909, Kretschman (NSW); Townsville, Dec 1961, Kennedy (BRI); Shute Harbour, Jan 1968, Jones (BRI). South Kennedy District: Mackay — Sarina, Sep 1968, Jones (BRI), Jan 1970, Byrnes1733 (DNA); Sarina, Jul 1964, Jones (BRI). Port Curtis District: Percy Is, Mar 1906, Tryon (BRI). Wide Bay District: Fraser I., May 1964, Jones (BRI); Traviston, Oct 1929, White 6392 (BRI). Moreton District: Bribie I., May 1964, Smith 12140 (BRI), Aug 1921 & Oct 1921, White (BRI).

Habitat: Landward edge of mangrove formations.

Distribution: Tropical shorelines of Eastern Africa, India, South East Asia, Malaysia, Northern Australia and Polynesia.

Observations and notes: A fragment of the type material was seen and it matches the Australian specimens examined. The types of the taxonomic synonyms were not seen because of the difficulty in tracing the material. This subject has already been dealt with in a number of texts and revisions.

Lumnitzera racemosa var. **lutea** (Gaud). Exell has not been positively identified among the Australian specimens although Fitzgerald reported the flower colour of a specimen collected in the Kimberley region as being yellow. Exell indicates that he retains the variety of flower colour alone although originally it was thought to be associated with gland tipped calyx lobes. The discovery of white flowers specimens with gland tipped calyx lobes in New Guinea and the Philippines proved this previous assumption incorrect.

QUISQUALIS L., Sp. Pl. ed. 2, 1:556 (1762); Sloot., Bijdr. Combr. 45 (1919), Bull. Jard. Bot. Btzg. 3, 6:59 (1924); Exell, J. Bot. 69:117 (1931), in van Steenis, Fl. Mal., 4:544 (1954).

Kleinia Crantz, Inst., 488 (1766) non Jacq. (1763). Sphalanthus Jack in Mal. Misc. 2, 7:55 (1822). Climbers woody. Leaves opposite or subopposite, entire, glabrous or hairy; petioles partly persisting after the fall of the leaf, their bases forming thorns. Flowers perfect, actinomorphic or slightly zygomorphic, five merous, in elongated, terminal or axillary bracteate spikes. Receptacle hairy or nearly glabrous, divided into a lower part surrounding and adnate to the ovary and a tubular to narrowly tubular upper part terminating in the calyx lobes, the latter part caducous. Calyx lobes 5, triangular, sometimes with filiform tips. Petals 5, rather large for the family and much exceeding the calyx lobes, enlarging during anthesis. Stamens 10, biseriate, inserted inside and near the mouth of the upper receptacle; anthers versatile. Disc narrowly tubular or absent. Style adnate for part of its length to the inner wall of the upper receptacle. Ovules 2-4; funicles sometimes papillose. Fruit dry, oblong, narrowed at both ends, deeply five - sulcate between the longitudinal wings; seed one, longitidunally sulcate.

This genus is not native in Australia but one species, *Q. indica* has become established in some area. This species rarely produces fruit and reproduces by means of root suckers. It is surprisingly persistent even in the drier monsoonal areas where it is commonly seen in areas of past habitation and is often the only remanent of previous gardens.

Quisqualis indica L., Sp. Pl. ed. 2, 1:556 (1762); Meeuse in Back., Fl. Java (em. ed.) 4, fam. 101:5 (1944); Exell in van Steenis, Fl. Mal., 4:547 (1954); Coode, Man. For. Trees Papua & N.G. I(rev.):84 (1969). Type: Specimen from Hortus Cliffortianus held in the Linnean Society Herbarium under index 553:1. This specimen was selected by Exell as the lectotype.

Kleinia quadricolor Crantz, Inst., 2:488 (1766).

Quisqualis pubescens Burm. f., Fl. Ind., 104 (1768).

Quisqualis glabra Burm. f., Fl. Ind., 104 (1768).

Quisqualis spinosa Blanco, Fl. Filip., ed. 2:254 (1845).

Quisqualis densiflora (non Wall. ex Miq.) F.- Vill. Novis App., 81 (1880).

Climber woody or small, procumbent shrub. Young branchlets tomentose, villose, pilose, appressed or sparsely pubescent, rarely sparsely glandular. Leaves opposite or subopposite, papyraceous, elliptic or elliptically oblong, acuminate, shortly attenuate or truncate at the base, 3-18 cm long, 2-9 cm wide (usually) less than 12 cm long in Australia), usually glabrous in Australia; petioles tomentose to glabrous, 0.3-2 cm long; petiolar thorns up to 1.5 cm long. Spikes terminal or axillary, 2-0 cm long. Bracts lanceolate or elliptic, acuminate, 6-10 mm long, 2-3 mm wide. Flowers pleasantly scented. Lower receptacle sericeous or pubescent, 3-4 mm long. Upper receptacle narrowly tubular, slightly expanded at the apex, outside varying from tomentose or nearly glabrous. Calyx lobes triangular, acuminate, 1-2 mm long. Petals oblong, white at first, becoming red, 1-2 cm long, 0.5-1 cm wide, imbricate, sparsely pubescent. Stamens with glabrous filaments, 7-8 mm long. Style adnate to the inner wall of the upper receptacle upper part free for ca 15 mm. Fruit dark brown, ovate-elliptic in outline, usually appressed pubescent, 2.5-4 cm long, 0.7-1.3 cm wide with five stiff wings.

WESTERN AUSTRALIA: Kimberley Research Stn, Mar 1964, *Richards* (CANB). NORTHERN TERRITORY: Darwin, Jul 1969, *Bymes* 1663 (DNA); Daly Waters, Mar 1972, *Bymes* 2502 (DNA). QUEENSLAND: MORETON DISTRICT: Brisbane, Feb 1958, *Perrotta* (CANB).

Habitat: As an ornamental in gardens and a remnant of deserted garden areas in monsoonal regions.

Range: Widespread in the tropics of the Old World and commonly planted in tropical countries including Australia.

Observation and Notes: There is no indication of the origin or the locality of the collection of the specimen Exell chose as the lectotype.

Due to the difficulty in obtaining the types of the taxonomic synonyms, these were not examined and Exell's evaluation of synonyms has been followed.

Because in most places that this species is found, in Australia, are in the drier monsoon areas, the plants often are restricted in their natural growth with the result being that the parts of the plant except the flowers are generally smaller than is indicated by overseas specimens.

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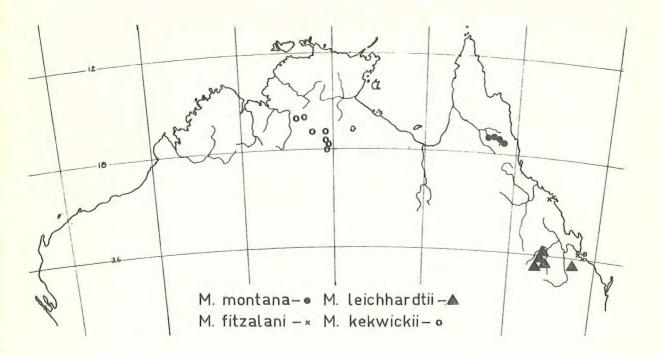
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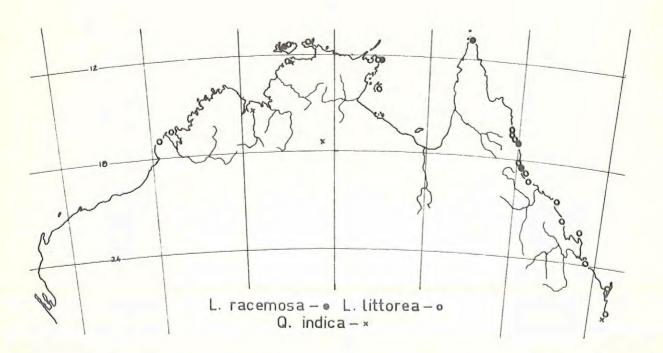
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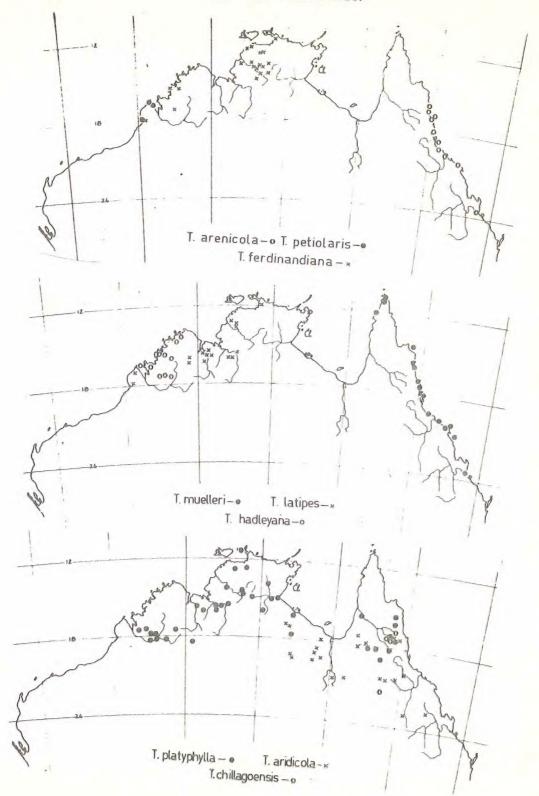
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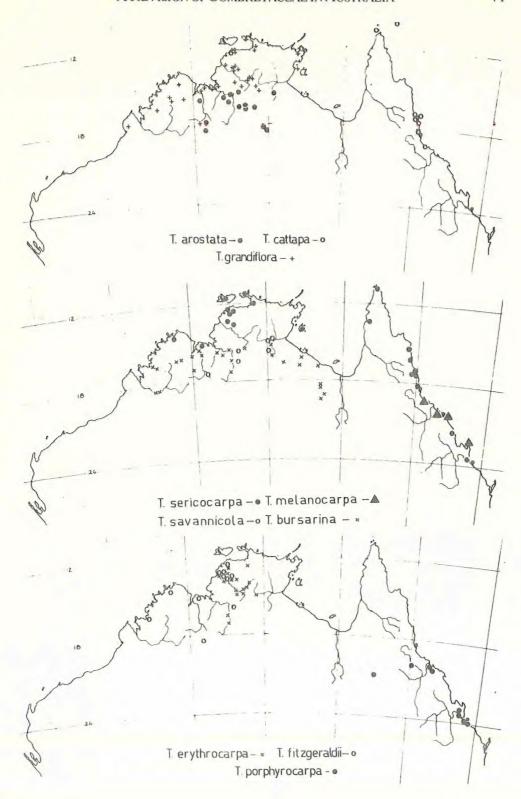
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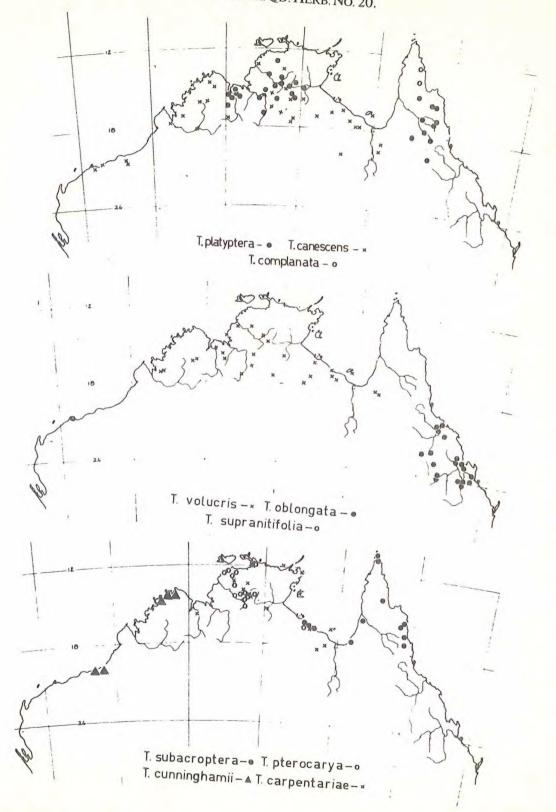
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